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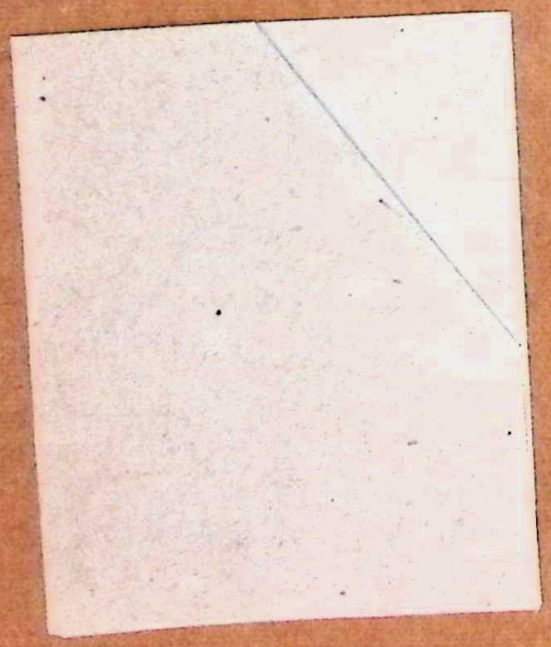
HANDBOOK OF OPERATING INSTRUCTIONS for RADIO COMPASS AN/ARN/7



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HANDBOOK OF OPERATING INSTRUCTIONS

for

RADIO COMPASS *AN/ARN-7

NOTE: This Handbook replaces AN 08-30ARN7-2 dated 27 March 1944.

RESTRICTED

(For Official Use Only)

The A. L. Garber Co., Ashland, O.—5-45, 17,800

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LIST OF REVISED PAGES ISSUED

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DESTRUCTION OF ABANDONED MATERIEL IN THE COMBAT ZONE

In case it should become necessary to prevent the capture of this equipment and when ordered to do so, DESTROY IT SO THAT NO PART OF IT CAN BE SALVAGED, RECOGNIZED, OR USED BY THE ENEMY. BURN ALL PAPERS AND BOOKS.

Means:—

1. Explosives, when provided.
2. Hammers, axes, sledges, machetes, or whatever heavy object is readily available.
3. Burning by means of incendiaries such as gasoline, oil, paper, or wood.
4. Grenades and shots from available arms.
5. Burying all debris or disposing of it in streams or other bodies of water, where possible and when time permits.

Procedure:—

1. Obliterate all identifying marks. Destroy nameplates and circuit labels.
2. Demolish all panels, castings, switch- and instrument-boards.
3. Destroy all controls, switches, relays, connections, and meters.
4. Rip out all wiring and cut interconnections of electrical equipment. Smash gas, oil, and water-cooling systems in gas-engine generators, etc.
5. Smash every electrical or mechanical part, whether rotating, moving, or fixed.
6. Break up all operating instruments such as keys, phones, microphones, etc.
7. Destroy all classes of carrying cases, straps, containers, etc.
8. Bury or scatter all debris.

DESTROY EVERYTHING!

UNSATISFACTORY REPORT

For U. S. Army Air Force Personnel:

In the event of malfunctioning, unsatisfactory design, or unsatisfactory installation of any of the component units of this equipment, or if the material contained in this book is considered inadequate or erroneous, an Unsatisfactory Report, AAF Form No. 54, or a report in similar form, shall be submitted in accordance with the provisions of Army Air Force Regulation No. 15-54, listing:

1. Station and organization.
2. Nameplate data (type number or complete nomenclature if nameplate is not attached to the equipment).
3. Date and nature of failure.
4. Radio model and serial number.
5. Remedy used or proposed to prevent recurrence.
6. Handbook errors or inadequacies, if applicable.

For U. S. Navy Personnel:

Report of failure of any part of this equipment during its guaranteed life shall be made on Form N. Aer. 4112, "Report of Unsatisfactory or Defective Material," or a report in similar form, and forwarded in accordance with the latest instructions of the Bureau of Aeronautics. In addition to other distribution required, one copy shall be furnished to the inspector of Naval Materiel (location to be specified) and the Bureau of Ships. Such reports of failure shall include:

1. Reporting activity.
2. Nameplate data.
3. Date placed in service.
4. Part which failed.
5. Nature and cause of failure.
6. Replacement needed (yes—no).
7. Remedy used or proposed to prevent recurrence.

For British Personnel:

Form 1022 procedure shall be used when reporting failure of radio equipment.

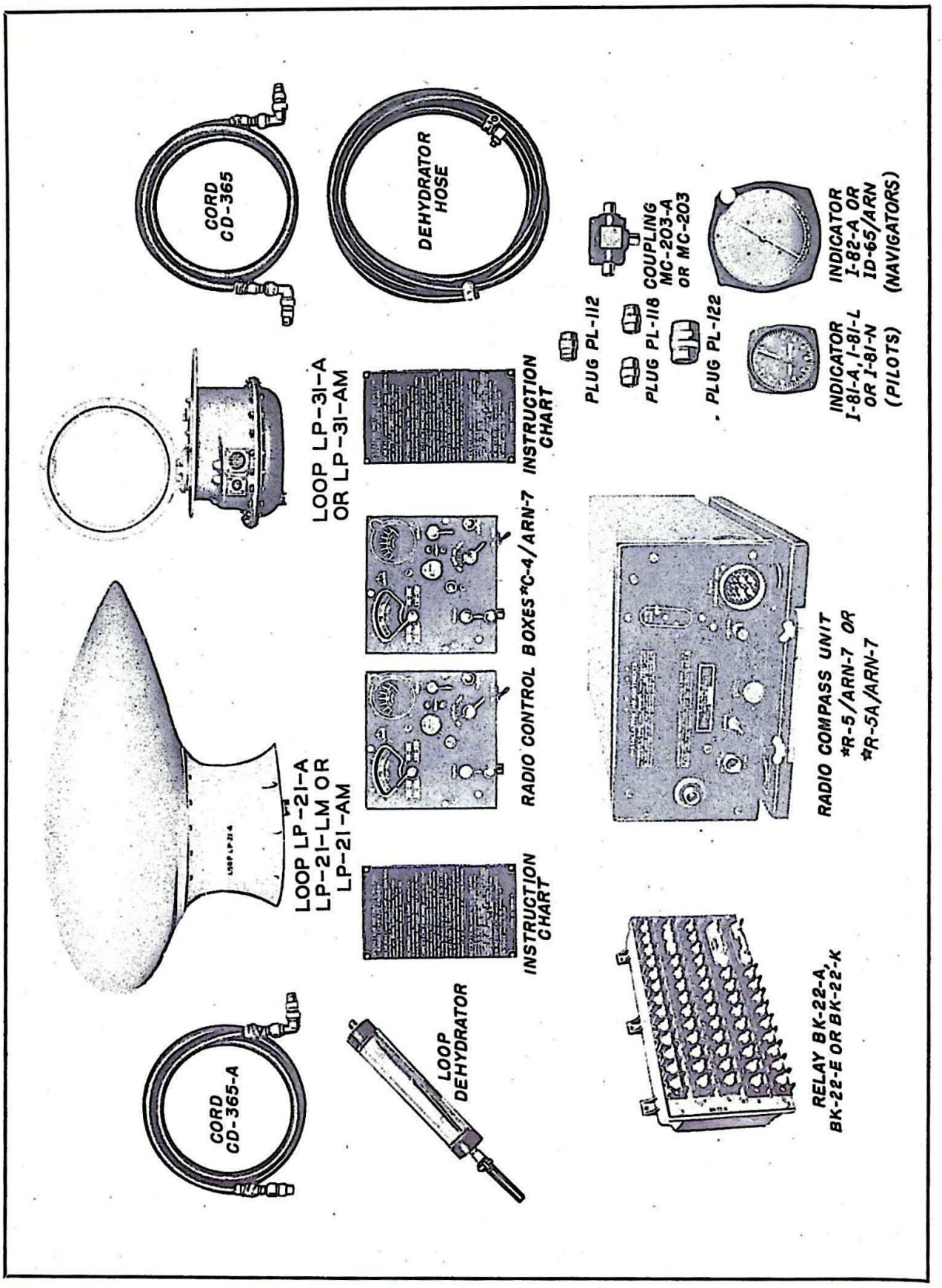


Figure 1-1. Radio Compass ★AN/ARN-7—Major Assemblies

IMPORTANT

References to Radio Compass Unit ★R-5/ARN-7 are equally applicable to Radio Compass Unit ★R-5A/ARN-7 * throughout this handbook.

SECTION I
GENERAL DESCRIPTION

1. GENERAL.

a. PURPOSE.—Radio Compass ★AN/ARN-7 is designed primarily to be used as an aircraft-navigational instrument†. Basically, the equipment is a radio receiver using a superheterodyne circuit and certain additional circuits necessary for radio compass operation. Two remote controls permit operation of the compass from either of two separate positions on the aircraft. Although only one remote control functions at one time, control may easily be switched from one to the other.

b. FREQUENCY.—The equipment has a frequency range of 100 kilocycles to 1750 kilocycles covered in four bands as follows:

Band one —100 to 200 kilocycles
Band two —200 to 410 kilocycles
Band three—410 to 850 kilocycles
Band four —850 to 1750 kilocycles

c. USE.—Radio Compass ★AN/ARN-7 is capable of providing the following:

(1) Automatic visual bearing indication of the direction of arrival of r-f energy and simultaneous aural reception of modulated r-f energy.

(2) Aural reception of modulated r-f energy, using a non-directional antenna.

(3) Aural reception of modulated r-f energy using a loop antenna.

(4) Aural-null directional indications of the arrival of modulated r-f energy using a loop antenna.

For each of these four uses the unit provides aural reception of either unmodulated or modulated r-f energy by operating the "CW-VOICE" switch on the radio control boxes.

d. POWER CONSUMPTION.

(1) Operating power for Radio Compass ★AN/ARN-7 is obtained from a 115-volt, 400-cycle a-c source. A d-c source is also required for operation of the control relays and band switch mechanism.

(2) Power requirements are given in the following table.

Power Source	*28-volt Installation*	*14-volt Installation Using Rectifier RA-59-A*
A-C	135 volts—1.00 ampere (Maximum)	135 volts—1.28 ampere (Maximum)
	115 volts—0.85 ampere (Normal)	115 volts—1.00 ampere (Normal)
	90 volts—0.70 ampere (Minimum)	90 volts—0.85 ampere (Minimum)
D-C	28 volts—0.70 ampere (Normal)	14 volts—0.70 ampere (Normal)
	28 volts—1.95 ampere (Band Switch Operating)	14 volts—1.95 ampere (Band Switch Operating)

e. INSTALLATION MATERIAL.—Certain Air Corps stock items are required for different installations. For quantities and sizes of such materials and fittings, refer to the Air Corps installation drawings applicable to the particular type of aircraft.

* Radio Compass Unit ★R-5A/ARN-7 has been designed to operate at lower ambient temperatures than Radio Compass Unit ★R-5/ARN-7. (Modification M1.)

† Radio Compass ★AN/ARN-7 is similar to Radio Compass SCR-269-G with the exceptions of the radio control box, the radio compass unit, and a fourth frequency band (100 to 200 kilocycles) which is added to Radio Compass AN/ARN-7. To convert a Radio Compass SCR-269-G installation to a Radio Compass ★AN/ARN-7 installation, substitute Radio Compass Unit ★R-5/ARN-7 for Radio Compass Unit BC-433-G, and substitute Radio Control Box ★C-4/ARN-7 for Radio Control Box BC-434-A. For information concerning Radio Compass SCR-269-G refer to T.O. 08-10-175, Handbook of Operating Instructions.

2. EQUIPMENT SUPPLIED.

The following table lists equipment supplied.

Quantity per Installation		*Name of Unit*	*Army Type Designation*	*Navy Type Designation*	*Overall Dimensions (inches)*	*Weight (pounds)*
Single	*Dual*					
1	1	Radio Compass Unit including: 1 Mounting FT-213-A (not supplied with ★R-5A/ARN-7) 1 No. 6 Bristo Setscrew Wrench 5 Tube Shield MC-202 1 set of Vacuum Tubes, consisting of: 2 JAN-6F6 1 JAN-5Z4 4 JAN-6K7 1 JAN-6L7 2 JAN-6B8 1 JAN-6J5 1 JAN-6N7 1 JAN-6SC7 2 JAN-2051	★R-5/ARN-7 or ★R-5A/ARN-7	★R-5/ARN-7 or ★R-5A/ARN-7	19 13/16 x 12 x 7 1/8	48.13
1	2	Radio Control Box including: 1 Mounting FT-224-A 5 Lamp LM-32 or Mazda 323 (3 in use, 2 mounted spares) 1 No. 6 Bristo Setscrew Wrench	★C-4/ARN-7	★C-4/ARN-7	7 1/2 x 7 11/16 x 3 15/16	4.12 each
1	1	Loop (housing and mounting)	LP-21-A, LP-21-AM or LP-21-LM	25 3/8 x 9 x 15 1/4	10.37	
		or				
		Loop	LP-31-A or LP-31-AM	11 5/16 x 6 3/32 x 14 23/32	6.8	
1	1	Loop Dehydrator Loop Dehydrator connections consisting of: 1 right-angle hose fitting and jam nut 2 straight hose fittings 3 hose clamps 1 vinylite hose 5/16 in. i.d. x 3 in. long 1 vinylite hose 5/16 in. i.d. x necessary length		12 1/16 x 1 5/8 x 1 13/16	1.25	
1	1	Cord, includes: 2 Plug PL-108 2 Conduit Elbow FT-184 1 Flexible Conduit Assembly	CD-365		72 long, 1/2 dia	1.62
		or				
		Cord, includes: 2 Plug PL-108 1 Conduit Elbow FT-184 1 Flexible Conduit Assembly	CD-365-A		72 long, 1/2 dia	1.62
		or				
		Cord includes: 2 Plug PL-108 1 Flexible Conduit Assembly	CD-365-B		72 long, 1/2 dia	1.62
		or				
		Cord	CG-42/ARN	CG-42/ARN	168 long, 1/2 dia	3.80
		or				
		Cord	CG-95/ARN	CG-95/ARN	168 long, 1/2 dia	3.80
0	1	Coupling	MC-203-A		3 3/4 x 2 7/16 x 1 19/64	.34
1	1	Indicator (Pilot's)	I-81-A, I-81-L or I-81-N		3/4 x 3 1/4 x 3 11/16	.75
1	1	Indicator (Navigator's)	ID-65/ARN	ID-65/ARN	5 13/16 x 5 13/16 x 3 5/8	1.51
		or				
1	1	Indicator (Navigator's)	ID-82-A		5 1/8 x 5 1/8 x 4 3/32	1.19

Quantity per Installation		Name of Unit	Army Type Designation	Navy Type Designation	Overall Dimensions (inches)	Weight (pounds)
Single	Dual					
0	1	Relay (switching from one control box to other) includes: 1 Autotransformer	BK-22-K		11¾ x 7 x 3	5.25
1	0	Relay ("ON-OFF" switching)	SW-172-A SW-172-C, or SW-172-F (24 volt)		2¾ x 1⅜ x 1⅞	.31
		or				
1	0	Relay ("ON-OFF" switching)	SW-182-A SW-182-C or SW-182-F (12 volt)		2¾ x 1⅜ x 1⅞	.31
1	1	Plug (Loop power to connector panel)	PL-112		1$^{3}/_{32}$ dia x 1$^{5}/_{32}$ long	.06
2	2	Plug (1 for each bearing indicator to connector panel)	PL-118		1$^{3}/_{32}$ dia x 1$^{15}/_{32}$ long	.06 each
1	1	Plug (compass unit to connector panel)	PL-122		1$^{23}/_{32}$ dia x 2⅛ long	.2
1	2	Chart for Radio Compass ★AN/ARN-7			4½ x 7⅛ x $^{1}/_{32}$	.06 each

Total weight of Radio Compass ★AN/ARN-7—65 to 90 pounds.

3. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

The equipment listed in the following table is required but not supplied:

Quantity per Equipment	Name of Unit	Army Type Designation	Navy Type Designation	Required Characteristics
1	Antenna			Non-directional
1	Power Source			14 or 28 volt d-c
1	Power Source			115 volt, 400 cycle a-c
	Tuning shaft			Necessary lengths
	Suitable interconnecting wiring (Air Corps Specifications AN-J-C48)			Necessary lengths
1	Rectifier Unit (not used when 28-volt power supply is used)	RA-59-A		

4. INTERCHANGEABLE COMPONENTS.

The following table lists the parts which are electrically and mechanically interchangeable. However, differences may exist in internal construction.

Components	Interchangeable Components
Compass Receiver	Radio Compass Unit ★R-5A/ARN-7 and Radio Compass Unit ★R-5/ARN-7.
Loop	Loop LP-21-A, Loop LP-21-AM, and Loop LP-21-LM.
Loop	Loop LP-31-A and Loop LP-31-AM.
Relay	Relay BK-22-A, Relay BK-22-E, and Relay BK-22-K. (Relay BK-22-E and Relay BK-22-K include an autotransformer of 500-ohm impedance output for use with low impedance headsets.)
Indicator (Navigator's)	Indicator ID-65/ARN and Indicator I-82-A.
Indicator (Pilot's)	Indicator I-81-A, Indicator I-81-L, or Indicator I-81-N.

1. Indicator I-81-A for mounting from back of instrument panel.
2. Indicator I-81-L has dial different from Indicator I-81-A and can be mounted from front or back of instrument panels.
3. Indicator I-81-N is the same as Indicator I-81-L with the exception of the dial lettering and markings which are for night flight operation.

Cord: Cord CD-365, Cord CD-365-A, Cord CD-365-B, Cord CG-42/ARN, or Cord CG-95/ARN.

1. Cord CD-365 is 6 feet long with two 90° elbows.
2. Cord CD-365-A is 6 feet long with one 90° elbow.
3. Cord CD-365-B is 6 feet long.
4. Cord CG-42/ARN is 14 feet long with two 90° elbows.
5. Cord CG-95/ARN is 14 feet long with one 90° elbow.

SECTION II

INSTALLATION AND ADJUSTMENT

1. PRELIMINARY PROCEDURE.

a. UNPACKING.—Unpack the equipment and make the following checks:

(1) Check list of assemblies against assemblies actually received.

(2) Test all tubes in a tube tester and insert them in the radio compass unit. Be sure they are firmly seated in their respective sockets and that all grid clips and grid cap shields are pushed down tightly.

(3) Check all lamps and fuses, both operating and spares.

(4) Check operation of tuning drives and all controls on both control boxes for freedom of operation.

(5) See that all components are in good condition. Pay particular attention to the seal between the loop housing and base of Loop LP-21-A, LP-21-AM, or LP-21-LM.

(6) If the system voltage in a dual-remote control installation is 12 to 14 volts, insert the connecting link between terminal 59 and terminal 60 of Relay BK-22-K. You will find this link in a bag supplied with Relay BK-22-K. If the system voltage is 24 to 28 volts, this link is not required.

b. LOOP COMPENSATOR CHECK.

(1) Remove Compensator MC-217 from Loop LP-21-A or LP-31-A, or remove Compensator MC-507 from Loop LP-21-AM, LP-21-LM, or LP-31-AM.

(2) Check to see that no correction is set up on the compensator.

(3) If calibration data is available for an identical installation in the particular type of aircraft concerned, set up the correction in accordance with Section II, paragraph 13*c*.

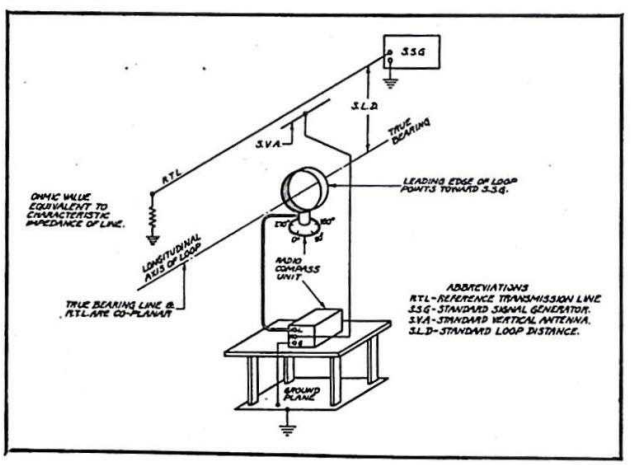


Figure 2-1. Compass Test Set-Up

2. BENCH TEST.

Use a standard transmission line test set-up if available. (See fig. 2-1.) If the compass test set-up is not available, use a non-directional antenna approximately 5 feet high. Interconnect the components as shown in figures 5-15, 5-16, 5-17 or 5-18 and test as follows:

a. Turn function switch on control box to "COMP."

b. Tune in several stations on each band to check ability to receive signals.

c. Adjust the "AUTO SENS" control on the receiver unit so that the loop is oscillating or hunting about $\pm$ 0.25 degree on each side of the mean indication. This main bearing should check with geographical bearings within 1 degree.

d. From a knowledge of the distance, power, and direction of the station, make a rough check on the performance of the equipment.

e. Allow the equipment to operate for at least ½ hour. Check operation of the headset in the audio output jacks of both radio control boxes. Vibrate or jar the equipment. Any clicks or increase in noise will require a thorough investigation and removal of the cause. Poor soldering of wires to the plugs and noisy vacuum tubes are the most common sources of trouble.

3. INSTALLATION PROCEDURES.

a. BONDING AND SHIELDING.—Only with efficient bonding and shielding of the ignition, generator, and other electrical systems will an aircraft radio receiver operate satisfactorily. When installing any radio compass, follow exactly the directions for bonding and shielding given in Air Corps Technical Orders and the Handbook of Instructions for Airplane Designers.

b. ANTENNA REQUIREMENTS.

(1) GENERAL.—Radio Compass ★AN/ARN-7 performs best with a non-directional antenna of about 0.25-meter effective height and 50-micromicrofarad capacitance. The size of the non-directional antenna may vary in size and still provide satisfactory operation. On aircraft which will accommodate any one of several types of antenna installations, use the type which most nearly meets the above requirements and which, in addition, has the largest possible ratio of vertical to horizontal length. Vertical rod antennas and T-type wire antennas supported by stub-masts have been found satisfactory. Keep the capacitance of the lead-in as low as possible. Do not use coaxial line for the antenna lead-in.

(2) LOOP ANTENNA.—The loop antenna is a center-tapped, eight-turn loop which has an inductance of 25 microhenries. It is connected to Radio Compass Unit ★R-5/ARN-7 by means of three slip rings and Cord CD-365, CD-365-A, CD-365-B, CG-42/ARN or CG-95/ARN. These loop cords are shielded and have a distributed capacitance of 140 micromicrofarad + 3, —7 percent. Connect the shield braid to the "GROUND" post of the radio compass unit at one end to the aircraft structure near Loop LP-21-A, LP-21-AM, or LP-21-LM; or Loop LP-31-A or Loop LP-31-AM at the other end.

c. LOOP LP-21-A, LP-21-AM, or LP-21-LM.

(1) LOCATION.—Locate the loop on the fore-and-aft center line of the fuselage as far as practicable from sources of interference from the engine, metal masses, and conductors. Before deciding where to put the loop, consider:

(*a*) The space available for the base and housing of the loop.

(*b*) The structural requirements of the loop and aircraft.

(*c*) The length of Cord CD-365, CD-365-A, CD-365-B, CG-42/ARN or CG-95/ARN.

(*d*) The location of the radio compass unit.

(*e*) The flying characteristics of the plane. For example, do not mount the loop on a primary structural member of the belly since the aircraft may be damaged beyond repair if it lands with wheels retracted. Areas affecting safety in flight, operation, and maintenance of the aircraft should not be obstructed by the loop and associated equipment.

(2) PROCEDURE.—The general position of the loop must be level during normal flight, and the broad nose of the loop housing must face forward. The following points give the information and explain the detailed operations needed to install the loop:

(*a*) Do not remove the loop housing to install the loop. This housing has been carefully sealed at the factory to prevent entrance of moisture which may damage the loop mechanism. Do not apply paint of any kind to the conductive housing of Loop LP-21-LM.

(*b*) Eight 7/32-inch holes in the mounting base provide for No. 10 fillister head screws which are used to mount the loop securely. (See fig. 2-2.) In locating the mounting holes to match the eight holes in the base, the fore-and-aft holes must be exactly in line (or within ±0.25 degree) with the center line of the fuselage. To facilitate this alignment, reference lines are scribed on the edge of the loop mounting base. The broad nose of the loop housing *must* face forward.

(*c*) Make the necessary holes in the skin of the aircraft to provide for the plugs and their interconnecting cables in the loop base, and for the right angle fitting which provides connection to the dehydrator.

(*d*) Allow enough clearance inside the fuselage to attach and remove the loop cable, the junction box cable, and the hose connection to the dehydrator.

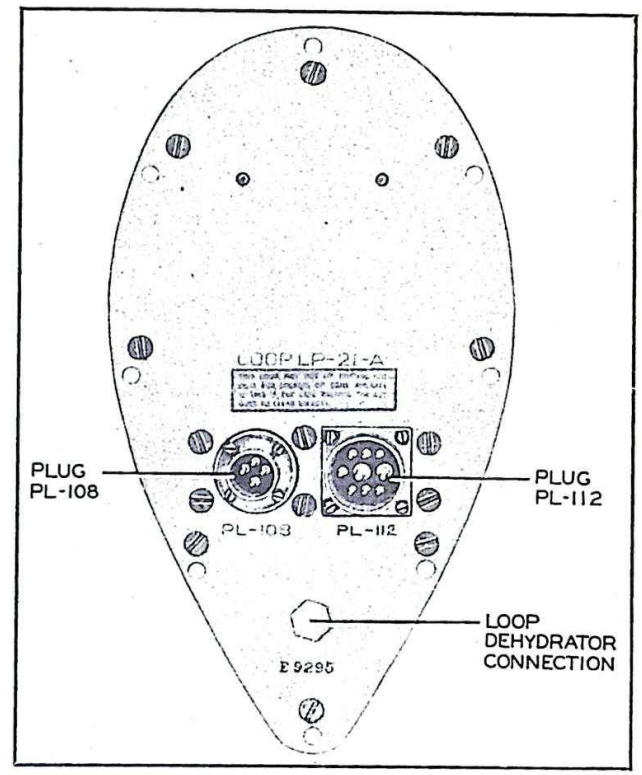


Figure 2-2. Loop LP-21-A, LP-21-AM or LP-21-LM —Bottom View

(*e*) Use a velutex, or similar gasket, between the loop mounting base and the aircraft to make a watertight seal in order to prevent water, oil, or dirt from entering the fuselage.

(*f*) For belly-mounted loops, build a small diversion dike or enclosure, about 1½ inches high, around the loop connections on the interior of the aircraft. This enclosure prevents any oil, water, grease, or hydraulic fluid which may accumulate in the belly of the aircraft, from damaging cable connections to the loop or entering the loop base.

d. LOOP LP-31-A or LP-31-AM.—Loop LP-31-A or LP-31-AM is designed for use in pressurized-cabin aircraft and is intended to be mounted within a plastic blister which is a part of the aircraft structure. Since installation detail is very closely allied to the structure of the particular aircraft, only the following precautions apply to any installation. (See fig. 5-1.)

(1) Mount the loop so that it is level during normal flight.

(2) Align the loop so that the lubber lines scribed on the mounting plate coincide exactly (±0.25 degree maximum deviation) with the center line of the fuselage.

(3) Mount the loop so that the drain plug in the plastic cover plate is aft.

(4) Loop LP-31-A or LP-31-AM is shipped with a wooden cradle bolted to the mounting plate. This cradle is made with a slotted block which engages the

loop to prevent damage to the loop drive mechanism as a result of lifting or carrying the loop assembly by the loop winding. *Keep this cradle on Loop LP-31-A or LP-31-AM until the loop is mounted in the aircraft.* (See fig. 5-12.)

(5) In sealing the mounting plates to the fuselage, be sure that the gasket and sealing compound will withstand a 7.5-pound pressure differential. The seal between the housing casting and the plastic cover plate must also withstand this pressure. After replacing the compensator assembly and cover plate following the adjustment for deviation compensation check the sealing to make certain it is adequate.

e. LOOP DEHYDRATOR.

(1) A dehydrator unit, used with Loops LP-21-A, LP-21-AM, LP-21-LM, LP-31-A, and LP-31-AM, removes moisture from air entering the loop. For proper loop operation, all air entering the interior of the loop assembly passes through the dehydrator unit and is dried. For this reason, the dehydrator hose and connections and all joints and seals in the loop assembly must be air tight.

(2) The dehydrator is connected to the loop assembly by the fittings provided and a 5/16 in.-ID vinylite hose. For proper operation of the dehydrator, keep the loop assembly well sealed.

(3) Mount the dehydrator where it can be visually inspected and easily replaced. Locate it as near the loop as is convenient. The mounting position must not be horizontal, for the breather end (open end) must be lower than the hose connection to prevent liquids from gathering in the dehydrator. Take care that the connecting tubing does not form a trap for condensed moisture. Steps for actual mounting of the dehydrator follow:

(*a*) Four No. 22 holes are provided in the two clips for mounting with No. 6 screws. (See fig. 5-2 for dimensions.)

(*b*) Mount the dehydrator unit and make certain there is no play between the mounting clips and the end caps of the dehydrator. Secure the clips with safety wire through the holes provided for this purpose.

(*c*) Cut the vinylite hose to the proper length and slip two hose clamps on the hose.

(*d*) Coat the threads on the right-angle hose fitting with Valvlube or other sealing compound, and thread the elbow into the mounting plate of the loop base so that the threads are entirely engaged. Turn the fitting in the direction of the approaching hose and tighten the elbow jam nut.

(*e*) Coat the scarfed section of the fitting with sealing compound. Slip the hose from the dehydrator on this scarfed section.

(*f*) Slip the hose clamp over the hose on the fitting and tighten.

(*g*) Remove the sealing tape from the dehydrator fitting. Coat the threads of the fitting with sealing compound.

(*h*) Assemble a straight hose fitting to the dehydrator.

(*i*) Coat the scarfed section of the hose fitting with sealing compound and slip the free end of the hose on this scarfed section.

(*j*) Check to see that the dehydrator hose is free from kinks and sharp bends.

(*k*) Slip the hose clamp over the hose on the fitting and tighten.

(*l*) Remove the sealing tape and plug from the dehydrator fitting opposite the loop connection. Coat the threads of the fitting with sealing compound.

(*m*) Assemble a straight hose fitting to the dehydrator. Coat the scarfed section of this fitting with sealing compound.

(*n*) Slip a hose clamp over the 3-inch length of vinylite tubing (vent tube) supplied with the dehydrator. Slip the tubing over the scarfed section of the fitting. Slide the hose clamp over the hose on the fitting and tighten it.

f. RADIO COMPASS UNIT ★R-5/ARN-7, INCLUDING MOUNTING FT-213-A.

(1) Secure Mounting FT-213-A to the principal structure of the aircraft with six No. 10 screws. (See mounting dimensions on figs. 5-3 and 5-4.)

(2) Bond the mounting to the metallic framework of the aircraft and fasten the ground braid on the mounting to the "GROUND" post on the radio compass unit.

(3) Install the radio compass unit so that the clearance on all sides allows free action of the shock absorbers for adjustment of the "AUTO SENS" control and for removal of the unit from the mounting. Provision is made in the radio compass unit for changing the location of the sockets from the front panel to the right side of the chassis. To make this change, remove the four screws which secure the socket and the four screws holding the socket-hole cover plate and interchange the socket and cover plate. Take care not to break the wires connected to the socket or to damage the terminals.

g. RADIO CONTROL BOX ★C-4/ARN-7, INCLUDING MOUNTING FT-224-A, AND INSTRUCTION CHART.

(1) Locate each Radio Control Box ★C-4/ARN-7 where the panel will be easily visible and the controls accessible to the operators. There must be enough clearance for connection of the tuning shaft, operation of the "CW-VOICE" switch, and for the cables to the connector panel and Relay BK-22-K.

(2) Mounting FT-224-A is not provided with mounting holes since the requirements will vary with individual installations. In drilling such holes, take care not to damage the wiring in the base. To avoid the possibility of short circuits or fouled gears, carefully clean out all metal chips. (See fig. 5-5.)

(3) Radio Control Box ★C-4/ARN-7 plugs into

Mounting FT-224-A. First tighten the plug release screw at the lower left corner near the tuning crank; then tighten the other three captive mounting screws. When removing the radio control box, loosen the plug release screw at the left of the tuning crank only after the captive mounting screws have been fully disengaged.

(4) Mount the Chart of Operation Instructions near each radio control box in a position easily readable by day or night.

h. INDICATOR I-81-A (PILOT'S).—Mount Indicator I-81-A (Pilot's) so that the entire bearing scale is visible to the pilot. This indicator is designed for mounting to the back of a panel. If indicator is not mounted on shock absorbing panel a shock mounting must be used. A 3 9/64-inch hole is necessary to expose the face of the instrument. (See fig. 5-6 for mounting dimensions.)

i. INDICATOR I-82-A (NAVIGATOR'S).—Mount Indicator I-82-A (Navigator's) so that the operator can see the entire bearing scale. It must be so mounted that the operator can set up headings and magnetic variations by turning the "VAR" knob in one corner of the indicator. This indicator may be mounted on either the front or back of a shock absorbing panel. If the indicator is mounted behind a panel, a 5 1/64-inch hole will expose the face of the instrument, and a 3/8-inch hole in the corner will clear the "VAR" knob. Three clearance holes for No. 6 screws are spaced around the edge of the indicator. (See fig. 5-7 for mounting dimensions.)

j. COUPLING MC-203-A.

(1) Coupling MC-203-A must be located on a solid surface at some point between Radio Compass Unit ★R-5/ARN-7 and the two Radio Control Boxes ☆C-4/ARN-7.

(2) Mount the coupling unit with four No. 8 screws. (See fig. 5-9.)

(3) Coupling MC-203-A is not used in single remote control installations.

k. RELAY BK-22-K.

(1) Relay BK-22-K is provided with six mounting lugs by which the relay unit is to be securely fastened in the airplane. (See fig. 5-10.) It is accompanied by a bag of terminal lugs and nuts, a fuse block marked "20 AMP.," and a terminal bar or link.

(2) Locate Relay BK-22-K to allow clearance on all sides for wiring.

(3) Pull the mounting screws down evenly to avoid distorting the relay.

(4) Arrange the cables to the relay terminals and bind in place so that they enter the relay from one side. It will then be possible to remove the relay panel screws and fold the relay panel outward to expose the internal parts for inspection without disconnecting any cable.

(5) Mounting is provided on the terminal panel for two Air Corps fuses, Specification No. 32271. The fuse block between terminals 49 and 50 marked "115V A.C.—FUSE 3A" is for the a-c supply fuse.

Note

The fuse block between terminals 49 and 50 of some relays is marked "FUSE 5A". However, a 3-ampere fuse should be used. The other fuse block between terminals 60 and 61 is to be short circuited. A circuit breaker meeting specification AN3161-P and whose capacity will vary with the auxilliary equipment used, is to be installed in the d-c supply lead between the equipment and the aircraft main bus bar.

(6) As normally delivered, Relay BK-22-K is connected for 24 to 28 volt installation. For variations see the specific instruction for the particular airplane.

(7) Relay BK-22-K is not used in single remote installations. (See sec. II, par. 10.)

4. MAKE-UP OF CABLES.

Plugs and wiring should be installed according to instructions for the particular aircraft. (Refer to the Handbook of Instructions for Airplane Designers and to the installation drawings.) To prevent the ferrule from rubbing the insulation, the wires should be bundled and taped, or wrapped with cord for about 2 inches back from the plug. In soldering wires to the plug terminals, use the following method:

a. Disassemble the plug by removing the spring retainer ring and withdrawing the plug body from the shell. Remove the slotted bakelite disc, and withdraw the terminals from the plug body.

b. Remove the insulation from the individual wires for a distance of 3/8-inch and tin the ends of the wires.

c. Run all wires through the metal shell of the plug.

d. Slip a 3/8-inch length of spaghetti tubing on each wire, but leave the tinned ends clear.

e. Tin the cups of the terminals being careful not to spill solder into the pin receptacle.

f. Solder the terminals to the wire. Use sufficient solder to fill the cups. Test each terminal to be sure that the joint is secure.

g. Make sure that each terminal is in its proper place in the plug body and that the spaghetti tubing is pushed down over the soldered joint. Replace the slotted bakelite disc.

h. Reassemble the plug body in the metal shell and replace the spring retainer ring. The plug retaining ring should fit snugly around the groove in the plug shell. If the ring is bent away from the groove, the socket pins may be grounded.

5. INTERCONNECTION OF EQUIPMENT.

a. The equipment and cables must not interfere with the airplane control or with the other instruments or equipment.

b. Fasten the cables and the flexible tuning shafts

TABLE 2-1. CONNECTION FOR VARIOUS LOOP AND NON-DIRECTIONAL ANTENNA INSTALLATION.

			Dual Remote Control			*Single Remote Control*		
Location of Loop on Aircraft	*Location of Non-directional Antenna*	*Compensator Azimuth Scale*	*Loop Motor Connections*	*Loop Compensator Connections*	*Loop L-R Switch*	*Loop Motor Connections*	*Loop Compensator Connections*	*Loop L-R Connections*
			Plug Term. PL-112 Panel	Plug Term. PL-112 Panel	Plug Term. PL-122 Panel	Plug Term. PL-112 Panel	Plug Term. PL-112 Panel	Plug Term. PL-122 Panel
TOP	TOP	BLACK	1 to 25 2 to 43	4 to 46 5 to 45	K to 15 H to 28	1 to 21 2 to 18	4 to 14 5 to 15	K to 11 H to 10
BOTTOM	BOTTOM	RED	1 to 25 2 to 43	5 to 46 4 to 45	H to 15 K to 28	1 to 21 2 to 18	5 to 14 4 to 15	H to 11 K to 10
TOP	BOTTOM	BLACK	2 to 25 1 to 43	4 to 46 5 to 45	H to 15 K to 28	2 to 21 1 to 18	4 to 14 5 to 15	H to 11 K to 10
BOTTOM	TOP	RED	2 to 25 1 to 43	5 to 46 4 to 45	K to 15 H to 28	2 to 21 1 to 18	5 to 14 4 to 15	K to 11 H to 10

securely in place where necessary to prevent rubbing or vibration. The cables connecting to Radio Compass Unit ★R-5/ARN-7 should be unsupported for a distance of 2 feet from the unit and should have enough slack so that they will not interfere with the action of the shock mounting.

c. Cord CD-365, Cord CD-365-A, Cord CD-365-B, Cord CG-42/ARN or Cord CG-95/ARN (use the one most convenient for the installation) connects Radio Compass Unit ★R-5/ARN-7 and the loop through its terminal plug, Plug PL-108. Do not change the length of this cord. If the cord is too long, coil the extra length wherever convenient. If it is too short, request a longer cord. (See fig. 2-2.)

6. LOOP AND BEARING INDICATOR CONNECTIONS.

The proper connections for any loop and non-directional antenna installation are shown in the above table. (See fig. 2-2.)

7. INTERCONNECTION WITH OTHER EQUIPMENTS.

a. MARKER BEACON RECEIVING EQUIPMENT.*—Provision has been made to supply 14 to 28 and 220 volts direct current for operation of the marker beacon receiving equipment.

(1) In dual remote control installations, make the low voltage connection between terminals 57 and 24, or 25, or 26 of Relay BK-22-K. Make the high voltage connection between terminal 2 and 25 of the connector panel of Relay BK-22-K. See tabulation as follows:

External Connections To Connector Panel	*Terminal No.*
Marker Beacon:	
+12, +24 volts d-c	57
−12, −24 volts d-c (Gnd.)	24, 25, 26
+220 volts d-c	2
−220 volts d-c (Gnd.)	25

(2) In single remote control installations, make the low voltage connection to terminals 28 and 20, or 21, or 22 of the connector panel. (See figs. 5-15 and 5-17.)

b. INTERPHONE.—Removal of the headset plug at the control box having control connects the input of the interphone to the audio output of the radio compass. Then the audio level to the interphone is controlled by means of the "AUDIO" knob at the controlling radio control box.

Note

Radio Compass ★R-5/ARN-7 is designed with an output impedance of 300 ohms or 4000 ohms. The compasses are shipped from the factory connected for 4000-ohm output impedance. If it is desired to change to 300-ohms output it is necessary to remove the yellow lead from the terminal 5 of the output transformer 610 and connect it to terminal 4.

(1) For high impedance interphone connection, connect the audio output of Radio Compass ★AN/-ARN-7 to the input of the interphone at the connector panel on Relay BK-22-K between terminal 16 and ground terminal 25. For single remote control installations, make the connections between terminals 3 and 22 of the connector panel.

(2) For low impedance interphone system, disconnect the yellow lead from terminal 5 of output transformer 610 in Radio Compass Unit ★R-5/ARN-7 and connect it to terminal 4 of the same transformer. Interphone connections are made to the same terminals of Relay BK-22-K or the connector panel as given in paragraph 7, *a* this section for high impedance connections. Do not connect interphone to tap on auto transformer.

8. SEPARATE INVERTER POWER SUPPLY.

The inverter input power may be controlled by the power on-off relay of Relay BK-22-K or in the case of

* A fuse has been added to Radio Compass Unit ★R-5/ARN-7 and Radio Compass Unit ★R-5A/ARN-7, modification M1, to protect the high voltage rectifier in the radio compass unit from damage which might occur if the marker beacon high voltage lead short-circuited to ground. If the marker beacon receiver is inoperative, check this fuse which is located on the terminal board that runs across the chassis bottom near the front of the radio compass unit. A spare fuse for replacement is held in a clip attached to the vertical baffle shield adjacent to this terminal board. If the radio compass unit is not used to supply high voltage to the marker beacon receiver, remove the fuse from the terminal board clips.

single control installations by a power on-off relay, Relay SW-172-A or SW-182-A. The power on-off relay is actuated by the operation of the function switch at the radio control box. This relay closes the a-c supply circuit to Radio Compass Unit ★R-5/ARN-7 and also completes the circuit between the d-c power supply and terminal 57 on the terminal panel (terminal 28 on the connector panel in the case of single control installations). Closing this latter circuit permits the use of a d-c operated inverter to supply the a-c power requirements of the radio compass equipment. The rated input voltage of the inverter must be the same as the d-c supply voltage available from the electrical system of the aircraft. The on-off relay of Radio Compass ★AN/ARN-7 is designed to carry the power requirements of the inverter unit. The size of the d-c supply circuit breaker should be the proper size to carry the load of inverter plus 1 ampere. The equipment may also be used with an inverter having the same output rating but requiring 12 to 14-volt d-c input, such as Inverter Unit PE-109-( ). Short circuit terminals 60 and 61 on the terminal panel, and install a 35-ampere circuit breaker externally to the d-c supply circuit. Larger or other inverter units require larger capacity circuit breaker.

9. RECTIFIER UNIT RA-59-A.

The control relays and band switch mechanism of Radio Compass ★AN/ARN-7 are designed for operation from a 24 to 28-volt d-c source. Therefore, in 12 to 14-volt installations, Rectifier Unit RA-59-A must be used to provide the additional voltage.

a. In 12 to 14-volt installations with dual remote control proceed as follows: (See fig. 5-16.)

(1) Remove the jumper between terminal 27 and terminal 57 of the connector panel of Relay BK-22-K.

(2) Connect terminals C and D (d-c output) of Rectifier Unit RA-59-A to terminals 27 and 57, respectively.

(3) Connect terminals A and B (a-c input) of Rectifier Unit RA-59-A to terminals 56 and 48, respectively, of the connector panel of Relay BK-22-K.

b. In 12 to 14 volt installations with single remote control proceed as follows: (See fig. 5-15.)

(1) Remove the jumper between terminals 26 and 28 of the connector panel.

(2) Connect terminals C and D (d-c output) of Rectifier Unit RA-59-A to terminals 26 and 28 respectively of the connector panel.

(3) Connect terminals A and B (a-c input) of Rectifier Unit RA-59-A to terminals 30 and 29 respectively of the connector panel.

10. SINGLE-REMOTE CONTROL INSTALLATIONS.

a. Refer to section I, paragraph 2 for list of components required.

b. Figures 5-15 and 5-17 show typical cording diagrams of the single remote control installation.

c. Since Relay BK-22-K is not used in single remote control installations, the terminal board which is a part of it will not be available. Provide the required number of terminals in a connector panel.

d. In normal dual remote control installations, a power on-off relay is provided as a part of Relay BK-22-K. Since Relay BK-22-K assembly is not used in the single remote control installation, a power on-off relay, Relay SW-182-A,-C, or -F or Relay SW-172-A, -C or -F, is required. Relay SW-182-A, -C or -F is for installations where the d-c supply is 12 volts, and Relay SW-172-A, -C or -F is for use with a 24-volt d-c supply.

11. AFTER INSTALLATION TESTS.

After Radio Compass ★AN/ARN-7 has been installed in the aircraft, make the following tests before placing the equipment in service.

a. INITIAL CHECKS.—Before turning on Radio Compass ★AN/ARN-7, check as follows:

(1) Check the battery voltage and polarity from terminal 61 on the terminal panel of Relay BK-22-K to ground. For single control installations check from terminal 34 on the connector panel to ground.

(2) If an inverter is used, see that its rated input voltage is the same as the available supply voltage. Be sure that the proper fuse or circuit breaker is in place. (Refer to sec. II, par. 8.) If the supply voltage is 12 to 14 volts, install a connecting link between terminal 59 and terminal 60. Then remove the jumper from terminals 27 to 57 and install Rectifier Unit RA-59-A. If the supply voltage is 24 to 28 volts, the link and rectifier unit are not used.

(3) In single remote control, see that Relay SW-182-A, -C, or -F is used for 12-volt installations and Relay SW-172-A, -C, or -F in 24-volt installations. In 12-volt installations, remove the jumper between terminal 26 and terminal 28, and see that Rectifier Unit RA-59-A is installed.

(4) Check the vacuum tubes to make sure that they are securely seated in their sockets. See that the grid clips and grid cap shields are making positive contact and are not shorting.

(5) Inspect the loop as follows:

(*a*) Lock and waterproof the mounting screws with Permatex No. 1 sealing compound or its equal.

(*b*) Check the loop housing and base casting for damage or cracks which may weaken it or admit moisture. A well sealed loop structure is essential for efficient dehydrator action and proper operation of the compass.

(*c*) Be sure that index lines on the fore and aft edges of the mounting plate are exactly in line with the fore and aft axis of the aircraft.

(*d*) See that the hose connecting the dehydrator to the loop assembly is not bent so sharply that it keeps the air from passing freely between these two units or that it forms a trap in which moisture may accumulate.

(*e*) Make certain that the Silica gel is activated

and ready for service. It should be a deep blue color.

(*f*) Remove the tape and plug from the end of the short piece of hose (vent tube) at the open end of the dehydrator to ensure that any air entering the loop will flow through the dehydrator.

(6) Test the operation of the tuning shaft and Coupling MC-203-A; inspect the connections at both radio control boxes. The "ALIGN" mark on both radio control boxes should coincide and line up with the dial index when the stop is reached.

(7) Check the base screws of Mounting FT-213-A and the Dzus fasteners which hold Radio Compass Unit ★R-5/ARN-7 to the mounting.

(8) See that Radio Control Box ★C-4/ARN-7 is securely mounted to the aircraft structure. Check the mounting screws on the panel for tightness.

(9) Be sure that Cord CD-365, CD-365-A, CD-365-B, CG-42/ARN or CG-95/ARN is secured. The ground braids at each end of the cord should be bonded to the aircraft structure. Check the tightness of Plugs PL-108 and the ferrule couplings on the plugs.

(10) Check the operation of instrument lights and light controls.

b. OPERATIONAL TESTS.

(1) Using headset check "ANT" and "LOOP" operation on all four bands. Next check compass operation and indicator response. Jar Radio Compass Unit ★R-5/ARN-7 to check possible sources of noise.

(2) Turn function switch to "COMP"; note whether or not the magnetic compass is affected.

(3) Check for effects of other radio equipment in the aircraft upon the communicational and navigational performance of Radio Compass ★AN/ARN-7. Determine the extent of any interference produced by the radio compass in the other radio equipment.

(4) Switch to "LOOP" and tune to several transmitting stations to see that the sensitivity is satisfactory.

(*a*) Operate "AUDIO" control to see that it properly controls the headset volume.

(*b*) Check the operation of the "LOOP L-R" switch. When it is in the "R" position, the bearing indicator pointers should rotate clockwise at a speed of about 10 degrees per second; when it is in the "L" position, the bearing indicator pointers should rotate counterclockwise at about the same speed. Similarly, if this switch is first pushed inward toward the panel and then turned to "R" and "L", the bearing indicator pointers should rotate clockwise and counterclockwise, respectively, at a rate of 30 to 55 degrees a second.

(*c*) When checking reception of transmitting station, rotate the loop by means of the "LOOP L-R" switch for maximum headset volume. On a clear day in a place free from electrical disturbances, it should be possible to receive clearly radio range signals 50 to 100 miles away, and broadcast signals 100 to 250 miles away, depending upon station power and external interference.

(5) Switch to "COMP" and swing the heading of the aircraft so that it points exactly toward a transmitting station. Use very accurate means to determine this heading. Tune Radio Compass ★AN/ARN-7 to this transmitting station. The indicator pointer should swing to the zero index within ±2 degrees. The accuracy of this zero heading bearing will depend upon:

(*a*) The accuracy with which fore and aft line of the aircraft was aligned with the line of direction of the transmitting station.

(*b*) The accuracy with which the loop mounting base was aligned with the fore and aft line of the aircraft.

(*c*) The amount of distortion in the direction of arrival of the radio waves. This distortion is caused by unsymmetrical location of the loop in relation to the metal mass of the aircraft and location of other unsymmetrical antennas or masts.

(*d*) The error in radio compass equipment does not exceed ±2 degrees under normal conditions at a zero heading. An error in indicated zero heading of not over ±5 degrees will not be serious if the cause of this error can be definitely shown to be caused by (*c*) above. In these circumstances, this error results from the particular aircraft installation and can be corrected when the radio compass deviation correction is applied to the compensator. (Refer to sec. II, par. 13.) If the bearing indicator pointer swings to 180 degrees instead of 0 degrees, the sensing is not correct. It can be corrected by connecting components properly. (Correct connections are given in sec. II, par. 6.)

(6) Swing the heading of the aircraft approximately 15 degrees to the right of the line of direction of the transmitting station. The bearing indicator pointer should swing immediately to an azimuth reading of about 345 degrees. An azimuth reading of 15 degrees instead of 345 degrees indicates improper interconnection of the components for the location of the loop in this installation. (Refer to sec. II, par. 6.)

(7) Swing the heading of the aircraft toward the transmitting station again. Switch to "LOOP" and rotate loop for an azimuth reading of 175 degrees as indicated by the indicator pointer. Switch to "COMP" and the pointer should return to the zero reading at a rate of 25 to 40 degrees per second when the a-c supply voltage is 115 volts. When the pointer arrives at zero, the over-shoot should not exceed 2 degrees under any conditions and will usually be less than one degree.

12. COMPASS SENSITIVITY ADJUSTMENT.

The "AUTO SENS" control, located on the front panel of Radio Compass Unit ★R-5/ARN-7 controls the sensitivity of the loop control circuits to small changes in bearing, and adjusts the hunting (residual oscillation) of the loop and bearing indicators to desired value. The adjustment procedure is as follows:

a. Set the function switch to the "COMP" position. The "AUDIO" control may be at any position.

b. Tune in a transmitter between 10 and 50 miles away, and allow time for the loop to reach the null.

c. After rotating the control cover-plate on the receiver unit to expose the slotted shaft, adjust control to obtain the desired amount of hunting of the indicator pointer about the indicated bearing position. Maintain enough sensitivity so that, if the loop is rotated 1 degree from its bearing position, the automatic control circuits will restore it to within 0.5 degree of the original bearing position. Check this sensitivity as follows:

(1) Switch to "COMP" with the radio compass tuned to a suitable transmitter.

(2) Note the azimuth reading of the bearing indicator pointer.

(3) Switch to "LOOP" and rotate the loop so that the indicator is 1 degree from the reading taken in (2) above.

(4) Switch to "COMP" and again note the azimuth reading of the bearing indicator pointer. This reading must be within 0.5 degree of that noted in (2) above.

13. RADIO COMPASS DEVIATION CALIBRATION.

a. MEASURING COMPASS DEVIATION.—Check the direction of radio bearings every 15 degrees from the fore and aft axis of the aircraft. Thus it is possible to determine and compensate for deviations caused by distortion of the radio field pattern due to wings, engines, propellers, antennas, and other parts of the aircraft.

Note

When the loop is on the top of the airplane, the calibration may be made on the ground. When the loop is beneath the fuselage, accurate calibration can be made only during a flight. Ground methods will not be discussed in detail because they require more time and more personnel, and because a flight check is still necessary. Using Indicator I-82-A (Navigator's) for all radio bearings it is possible to obtain calibration data in flight by the following method. Before making the calibration flight, check the compensator to see that no correction is set up on the compensator.

(1) To avoid excessive drift angles and errors in reading the bearing angles, make the test when the wind is less than 8 miles an hour and the air is smooth. Do not make the calibration within 1 hour of sunrise or sunset, or when bearings fluctuate widely.

(2) Choose a medium or high powered radio station between 25 and 100 miles away from the locality where the test is to be made. This radio station should not be in a congested channel or near other high powered channel signals which could, by slight mistuning cause bearing errors. The station, also, should normally provide good bearings with little or no fluctuation of the indicator pointer.

(3) Use the "VAR" knob on Indicator I-82-A (Navigator's) and set the azimuth scale zero to the index.

(4) Select a landmark or several landmarks (such as a road, railroad tracks, or section lines) which provide a direct line toward the radio station. Since power lines or railroads near the landmark can distort the radio path, find out whether or not distortion is present. Check the distortion by crossing the reference line at various angles while maintaining fixed courses by means of the directional gyro. If the bearing changes rapidly as the line is approached, distortion is present. Avoid this distortion by flying higher or by finding a new landmark.

(5) With the plane in level flight, fly along this reference line at an altitude low enough to avoid parallax error. If the airplane has a drift meter, use it to make sure that the direction of flight is parallel to or directly over the reference line.

(*a*) Set the directional gyro to zero.

(*b*) When passing over some predetermined point or line intersecting the reference, record both the bearing on Indicator I-82-A (Navigator's) and the reading on the directional gyro.

(*c*) Also record the drift meter reading if a drift meter is being used.

(*d*) These readings should be zero if the previous setting and the line of flight have been maintained.

This maneuver is shown in figure 2-3 as well as those discussed in the following paragraphs. In practice, it is best to have the co-pilot use figure 2-3 to direct the pilot and to check the location of the airplane at all times with respect to the flight pattern shown.

(6) Turn the aircraft to the left, and then swing back to the right, crossing the reference line at an angle of 15 degrees by the directional gyro. The pilot should be instructed to swing far enough out on these maneuvers to regain level flight some distance before the reference line is reached. Make readings only during conditions of level flight. Have the pilot inform the radio compass operator at the instant the airplane crosses the reference line. Record the radio compass bearing for that instant in the third column of figure 2-3. Greater accuracy can be obtained by using a drift meter since the drift meter observer can determine the exact moment of crossing the reference and can record the exact heading of the aircraft in relation to the reference.

(7) Repeat the preceding procedure throughout step I of figure 2-3, recording the data in the third column of figure 2-4. Return on the reference line as shown in step II. Reset the directional gyro each time a new step is begun.

(8) Repeat the above procedure until the entire flight pattern of figure 2-3 has been flown.

(9) During the above procedure, take care to avoid parallax in reading the instruments. Set the

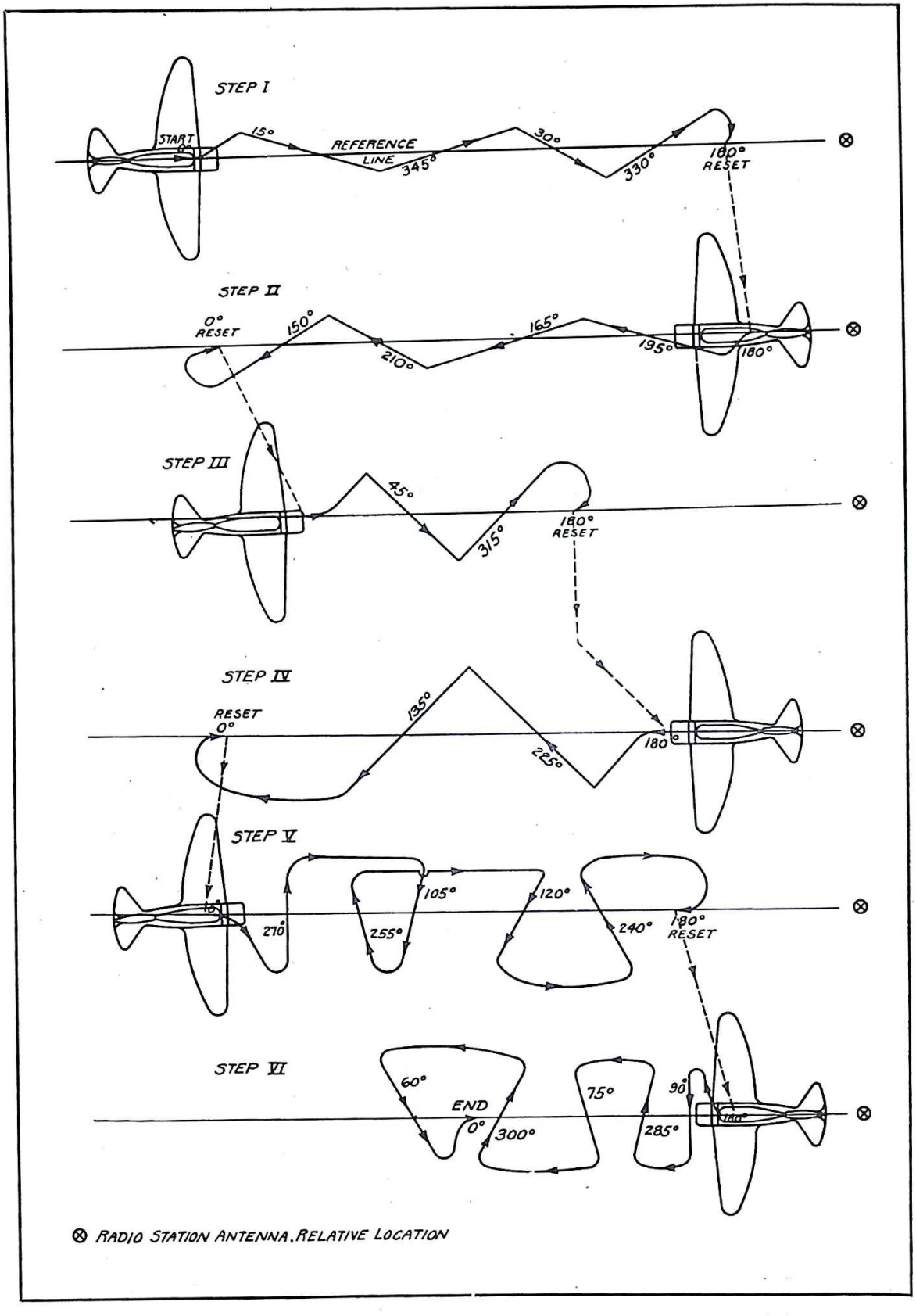


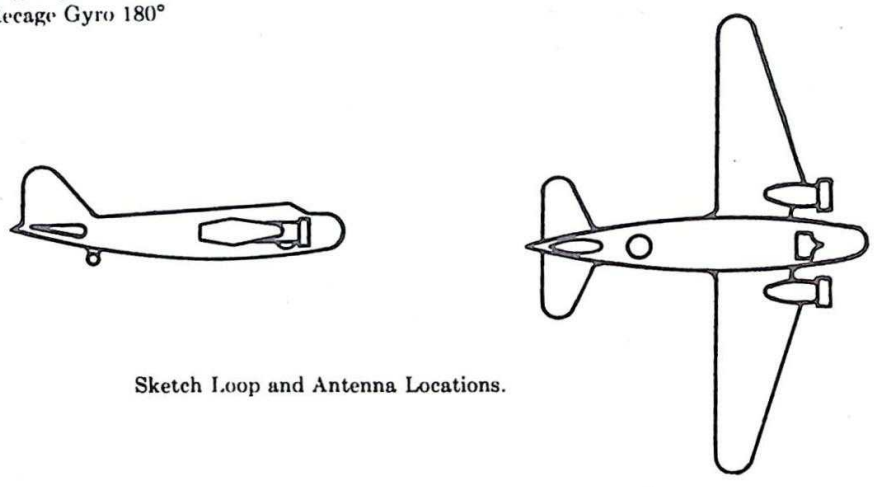
Figure 2-3. Procedure for Obtaining Radio Compass Deviation Data in Flight

NOTE: Head toward station over predetermined point on reference line, steady, set GYRO on 0° and check zero bearing.

Station Used _____
Frequency _____
Plane No. _____
Pilot _____
Recorder _____

	Flight Test Data for Curve			Compensator MC-217 Adjustment Data	
	Column # 1	Column # 2	Column # 3	Column # 4	Column # 5
	Gyro Bearing	Plane to Radio Station Bearing	Indicated Bearing	Compensator Inner Scale Zero Bearing	Compensator Pointer Bearing
*	0	0	0	0	0
	15	345		15	
	345	15		345	
	30	330		30	
	330	30		330	
**	180	180		45	
	195	165		315	
	165	195		60	
	210	150		300	
	150	210		75	
*	45	315		285	
	315	45		90	
**	225	135		270	
	135	225		105	
	270	90		255	
	105	255		120	
	255	105		240	
	120	240		135	
	240	120		225	
**	90	270		150	
	285	75		210	
	75	285		165	
	300	60		195	
	60	300		180	

NOTE: This form to be used in conjunction with "Radio Compass Deviation Calibration Curve."
* Cage Gyro 0°
** Recage Gyro 180°



Sketch Loop and Antenna Locations.

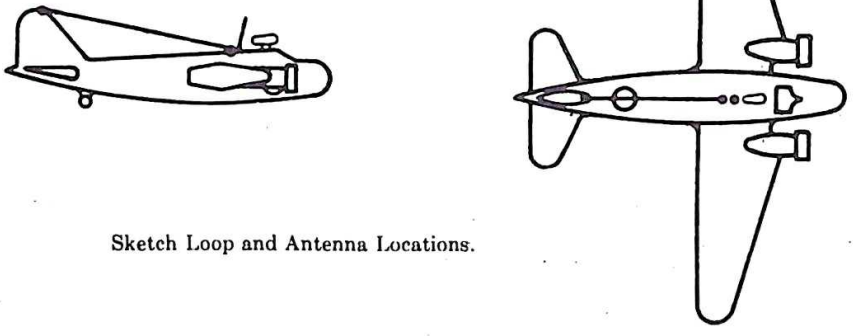
Figure 2-4. Radio Compass Deviation Calibration Data

NOTE: Head toward station over predetermined point on reference line, steady, set GYRO on 0° and check zero bearing.

Station Used ID- WWIL
Frequency 266
Plane No. B-23 39-27
Pilot
Recorder

	Flight Test Data for Curve		Compensator MC-217 Adjustment Data	
Column # 1	Column # 2	Column # 3	Column # 4	Column # 5
Gyro Bearing	Plane to Radio Station Bearing	Indicated Bearing	Compensator Inner Scale Zero Bearing	Compensator Pointer Bearing
* 0	0	0	0	0
15	345	349	15	29
345	15	7	345	340
30	330	338	30	48
330	30	16	330	321
** 180	180	180	45	62
195	165	170	315	306
165	195	188	60	73
210	150	159	300	293
150	210	197	75	82
* 45	315	325	285	281
315	45	27	90	90
** 225	135	146	270	271
135	225	208	105	100
270	90	90	255	263
105	255	248	120	111
255	105	112	240	254
120	240	221	135	124
240	120	131	225	244
** 90	270	269	150	139
285	75	64	210	228
75	285	291	165	158
300	60	43	195	208
60	300	309	180	180

NOTE: This form to be used in conjunction with "Radio Compass Deviation Calibration Curve."
* Cage Gyro 0°
** Recage Gyro 180°



Sketch Loop and Antenna Locations.

Figure 2-5. Radio Compass Deviation Calibration Data—Numerical Example

Aircraft A. C. No._____ By_____ Date_____
Station_____ Frequency_____ K.C. Equipment Type_____
Reference Line, Landmark:_____ Predetermined Point_____

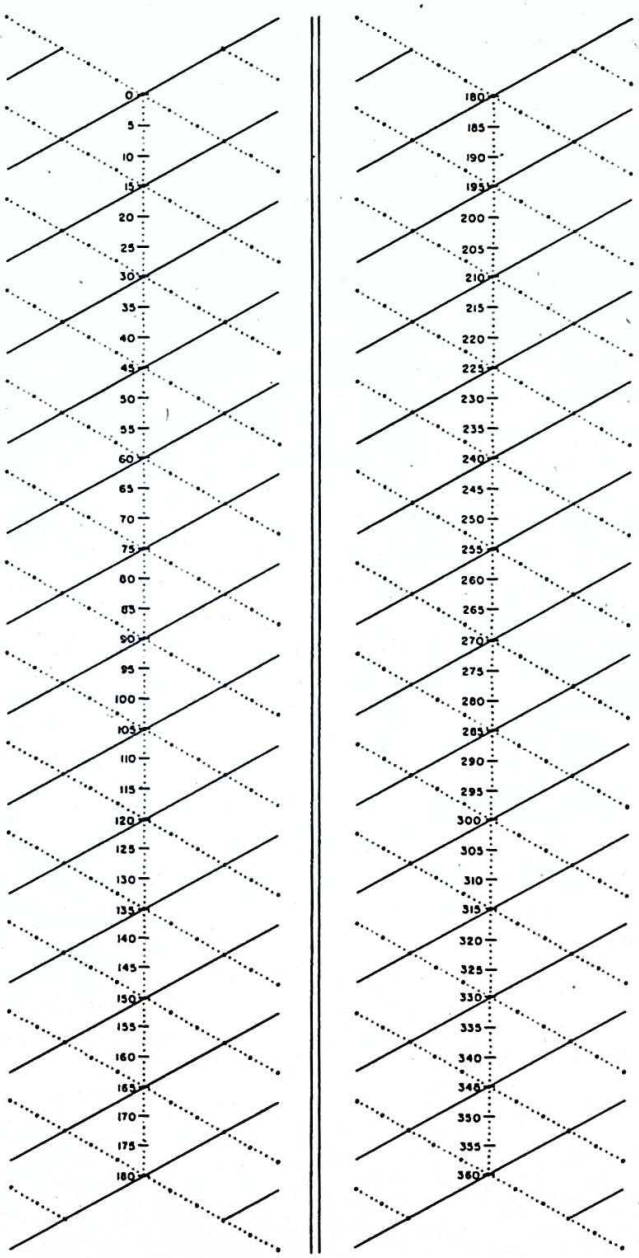


Figure 2-6. Radio Compass Deviation Calibration Curve

directional gyro accurately. Make one or two check runs to obtain the best accuracy.

(10) Calibration data obtained for a particular type of airplane can be used without change for all airplanes of that type when the location of the loop and other antennas is the same. Since all airplanes of the same type may not have the same radio installations, an accurate diagram showing antenna dimensions and the exact location of the loop will add to the usefulness of the recorded data. (See fig. 2-5.)

Note

Since radio compass deviation changes some with frequency, take calibration data at several frequencies to insure greatest accuracy in use. The readings used to set up the compensator in Loop LP-21-A, LP-21-AM, LP-21-LN, LP-31-A, or LP-31-AM should be obtained at some frequency between 200 and 800 kilocycles. In that frequency range the radio wave characteristics are better suited to Radio Compass ★AN/ARN-7 use. Under service conditions, and with the compensator unit properly adjusted, the over-all radio compass deviations should not exceed 3 degrees except at points of large rate of change of error between 15-degree rhumb lines or sectors.

b. DETERMINATION OF CORRECTION DATA. —After the radio compass deviation has been determined, plot the data and interpolate from the resulting curve. This is done as follows:

(1) Plot the indicated bearings on figure 2-4 from column 3 against the corresponding plane-to-radio-station bearing of column 2. Use the chart of figure 2-6 and see figures 2-5 and 2-7 for an example.

(*a*) Lay a straight edge parallel to the dotted line. (See note 1, fig. 2-7.) Through the chosen points of column 3, draw a fine line. The point at which this line intersects the solid 15-degree line (column 2) is the plot point. For a true bearing of 15 degrees (column 2), for example, the indicated bearing is seven degrees (column 3).

(*b*) Lay a straight edge parallel to the dotted line through the 15-degree graduation. This intersection is one point on the deviation curve.

(*c*) Repeat (*a*) and (*b*) for each of the 24 15-degree positions.

(*d*) Draw a smooth curve through the plotted points to form the deviation curve.

IMPORTANT

Do not try to apply corrections of more than ±20 degrees on the compensator. The correction curve should be smooth and essentially sinusoidal. If there are sharp discontinuities in the curve or if the rate of change of correction exceeds 12 degrees in 15 degrees of azimuth, find and remove the cause of these errors since they cannot be corrected by the compensator. Unsymmetrical antenna structures on the aircraft is usually the cause of these errors. After correcting them, rerun the radio compass deviation calibration. If antennas or the aircraft structure are changed in any way after the calibration test, the calibration must be rerun.

(2) Next, determine the values for column 5 from the deviation curve.

(*a*) Draw fine lines (see note 3, fig. 2-7) parallel to the solid lines between the intersections (see note 2, fig. 2-7) of the plotted deviation curve and the dotted lines to the vertical graduations.

(*b*) In column 5 record values for the points of intersection (see note 4, fig. 2-7) as read on the vertical graduations beside the 15-degree dotted line values in column 4. To determine the corrected pointer bearing for the loop position of 60 degrees (column 4) lay the straight edge parallel to the solid line and draw a fine line through the intersection of the dotted 60-degree line and the deviation curve. (See note 2 fig. 2-7.) This line passes through the graduations at 73 degrees. This bearing value is recorded in column 5. Similarly, a bearing of 105 degrees from column 4 gives a bearing of 100 degrees for column 5.

c. ADJUSTMENT OF COMPENSATOR SCREWS OF COMPENSATOR MC-217 OR COMPENSATOR MC-507.

(1) Remove Loop LP-21-A, Loop LP-21-AM, and Loop LP-21-LM from the airplane in order to reach the bottom cover plate. Loop LP-31-A or LP-31-AM need not be removed from the aircraft since the bottom cover plate can be reached within the plane.

(2) Remove the bottom cover plate. (See figs. 2-8, 2-10 and 2-12.)

(3) Take out the four screws to disconnect the four connector lugs from the terminal board on the compensator assembly.

(4) Remove the three fillister head mounting screws and lift the compensator assembly from the loop base casting. (See figs. 2-9, 2-11 and 2-13.)

(5) Check to see that no correction is set up on the compensator; but if there is, set the adjusting screws to zero compensation and calibrate again.

(6) Lay the compensator assembly with the azimuth scale up. Check to see that the proper azimuth scale is in place. (See figs. 2-14, 2-15 and 2-16.) The red scale is for belly mounting and black scale is for top mounting. This scale may be changed in the following way:

(*a*) Remove the four fillister head screws located around the top edge of the compensator.

(*b*) Remove the azimuth scale, and replace it with the right one.

(*c*) Replace the four fillister head screws.

(*d*) Seal these four fillister head screws in place with Glyptal or similar cement.

Aircraft A. C. No. B-23 39-27 By _____ Date AUG. 26-40
Station WWIL ·· —·· Frequency 266 K.C. Equipment Type SCR-242-C
Reference Line, Landmark: U.S. Highway #35 Predetermined Point Eaton, Ohio

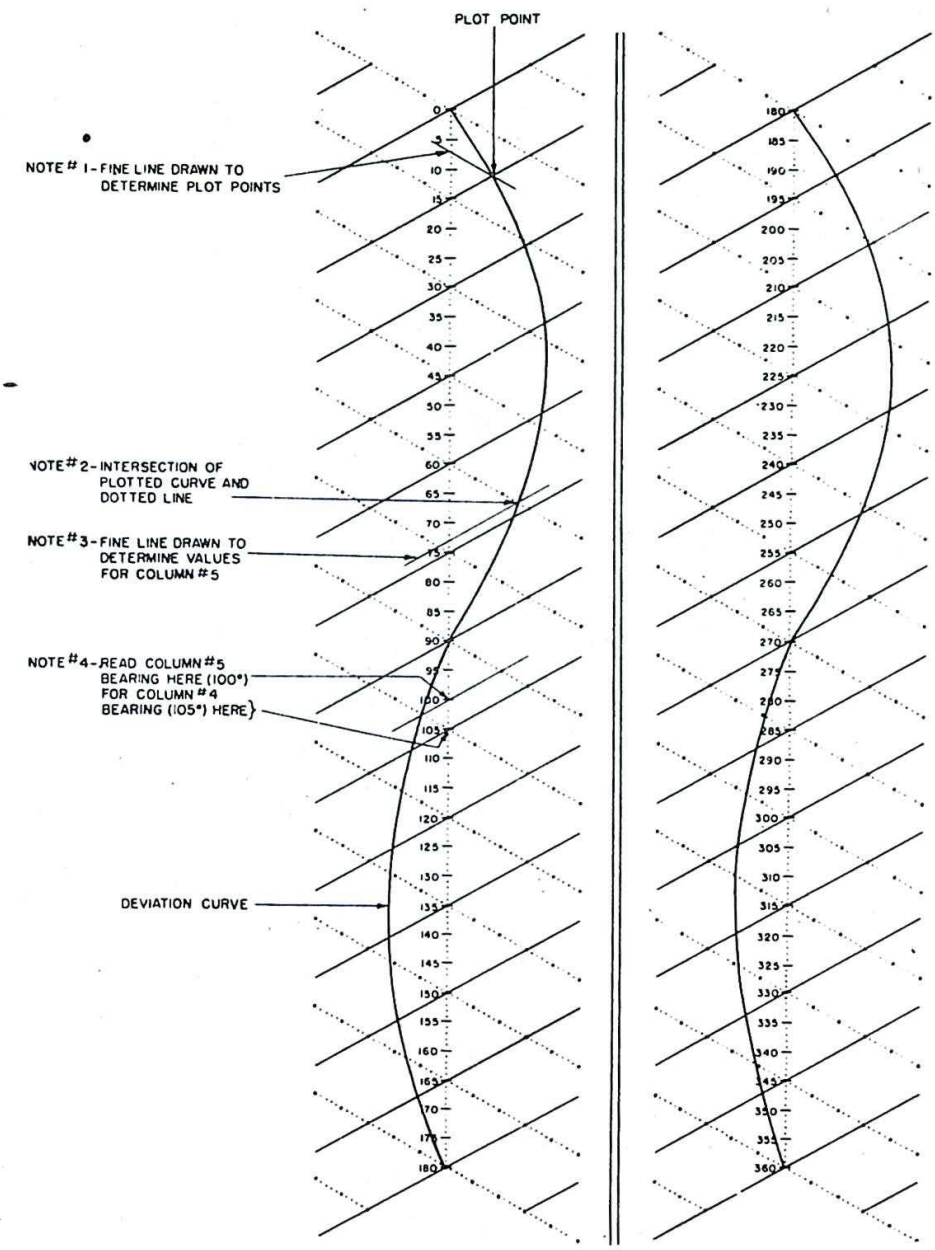


Figure 2-7. Radio Compass Deviation Calibration Curve—Numerical Example

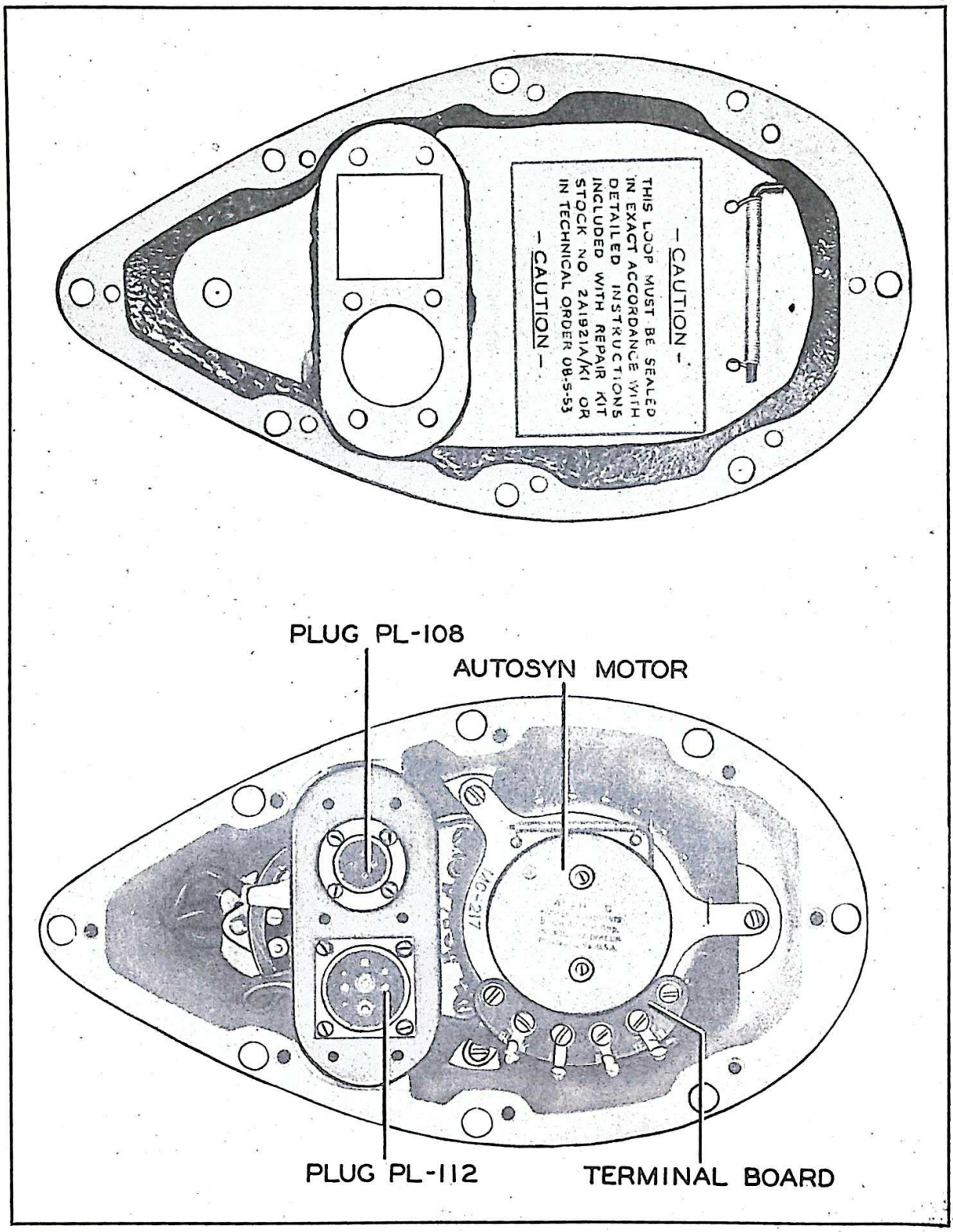


Figure 2-8. Loop LP-21-A—Bottom Plate Removed

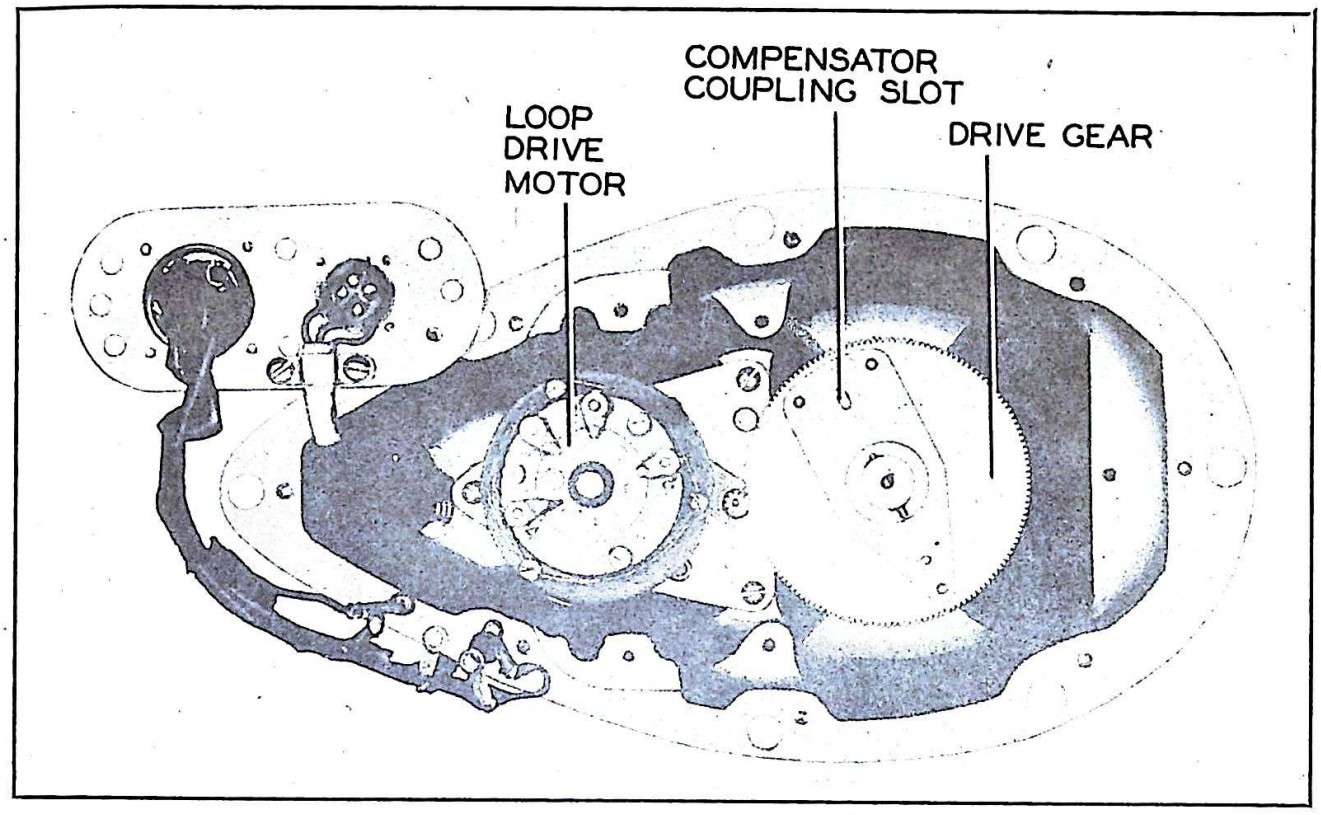


Figure 2-9. Loop LP-21-A—Compensator MC-217 Removed

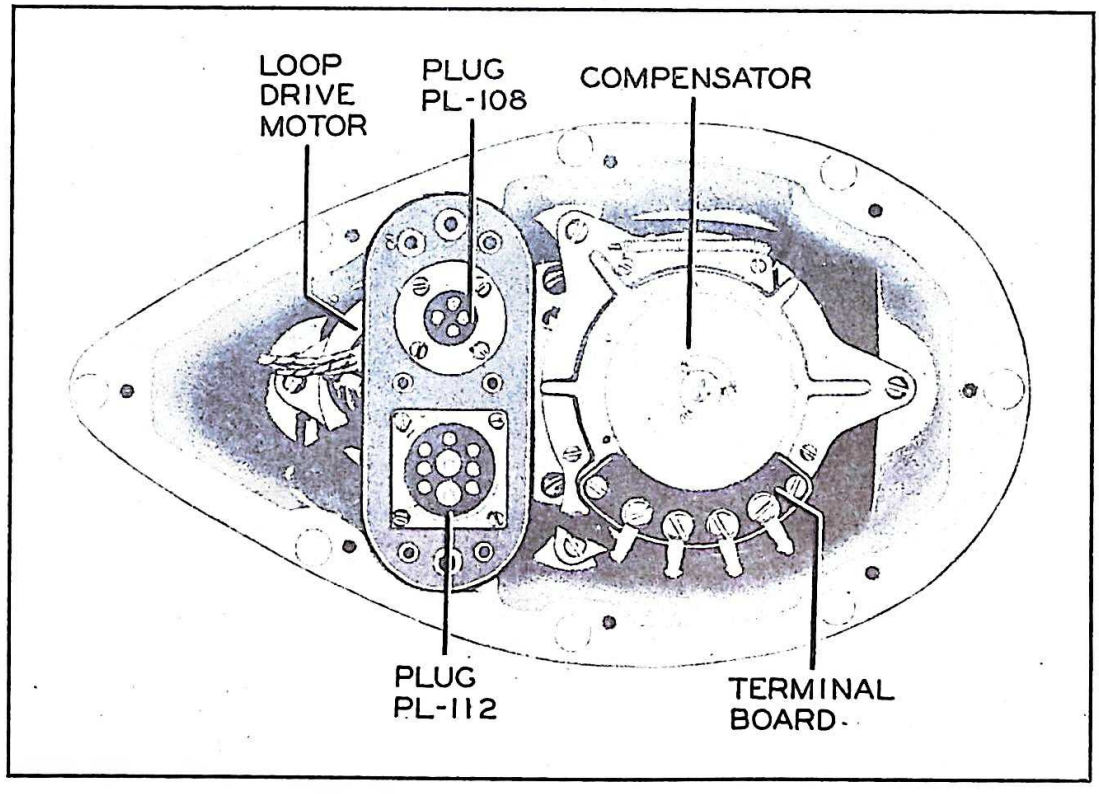


Figure 2-10. Loop LP-21-AM—Bottom Plate Removed

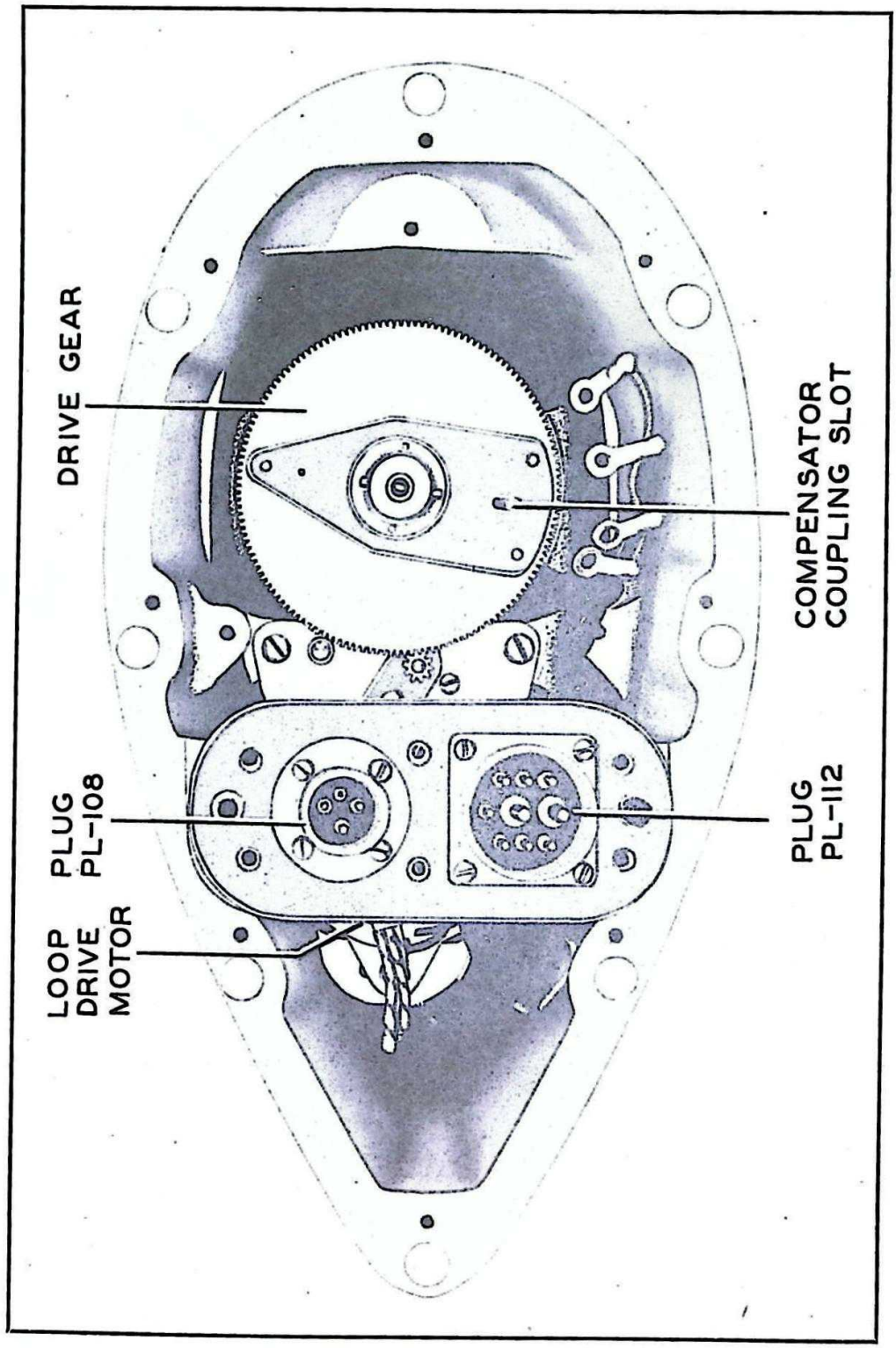


Figure 2-11. Loop LP-21-AM—Compensator MC-507 Removed

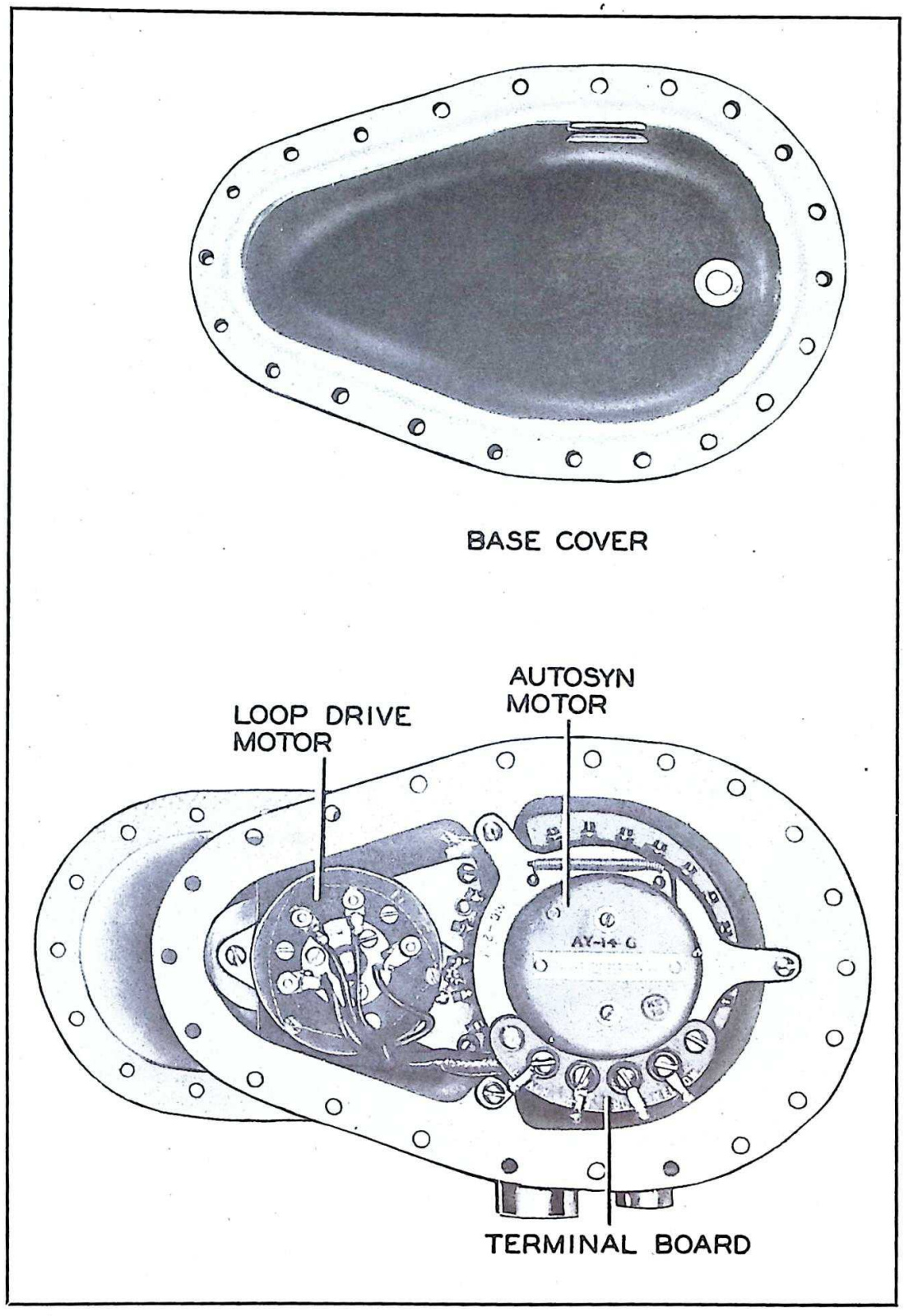


Figure 2-12. Loop LP-31-A—Bottom Plate Removed

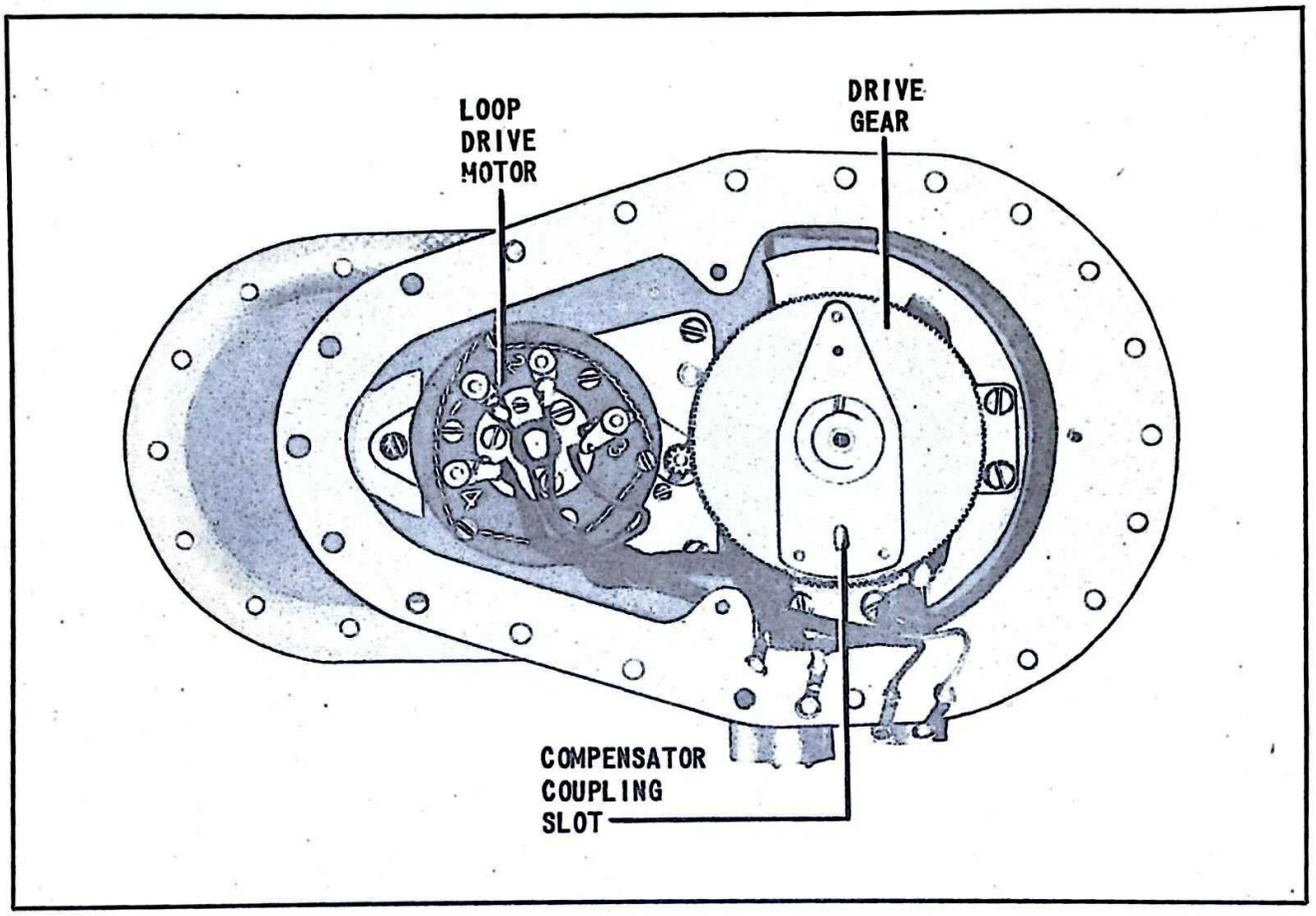


Figure 2-13. Loop LP-31-A—Compensator MC-217 Removed

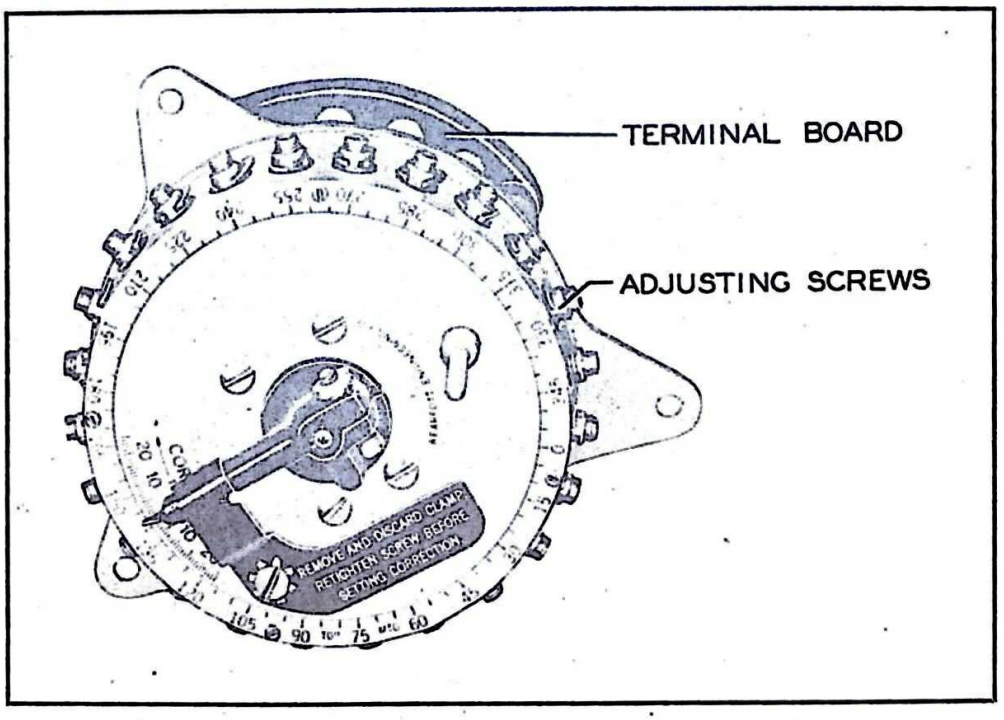


Figure 2-14. Compensator MC-507

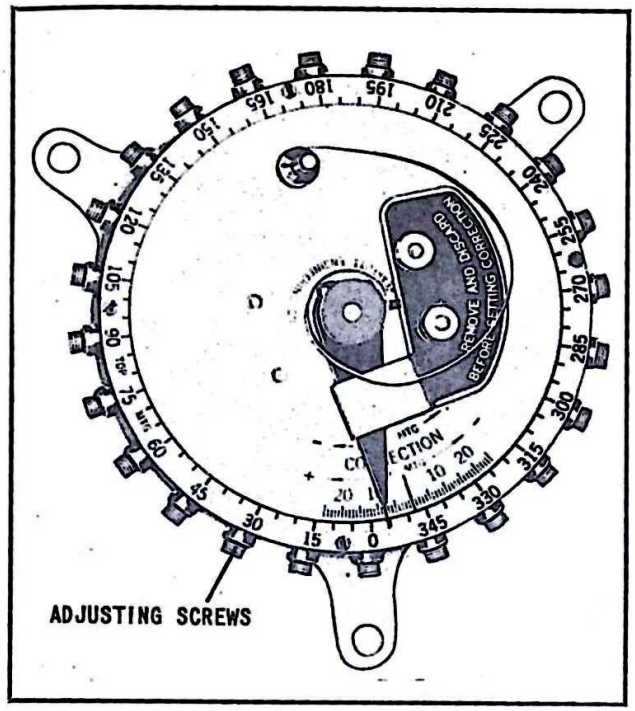


Figure 2-15. Compensator MC-217—With External Spiral Spring

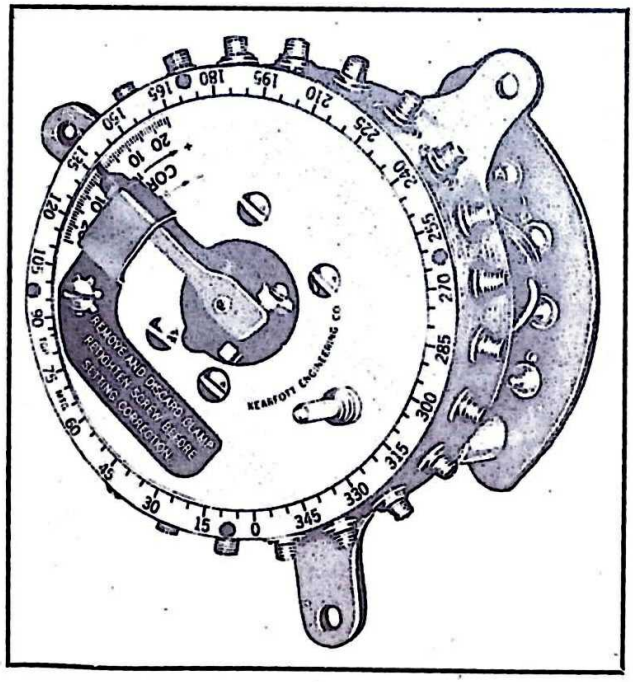


Figure 2-16. Compensator MC-217—With Die-Cast Pointer and Internal Spiral Spring

(7) If a temporary clamp on the compensator holds the pointer at zero, remove and discard this clamp. (See figs. 2-14, 2-15 and 2-16.)

(8) Before adjusting the screws, remove the wrench from its helical spring mounting on the side of the compensator assembly.

(9) Set the zero correction mark on the inner dial opposite the degree marking on the azimuth scale which corresponds to the heading in column 4, figure 2-4. With the wrench from the compensator assembly, adjust the compensator screw opposite this degree marking until the pointer reads the correct value shown in column 5.

(10) It is usually necessary to make the complete compensator adjustment in a series of from three to five cycles.

Caution

To avoid permanently damaging the cam strip in the compensator, do not let the adjustment of individual screws exceed the adjustment of adjacent screws by more than 5 degrees.

When all screws have been adjusted to this extent, the process may be repeated until the total compensation has been set up. Some compensation curves may require a variation of more than 5 degrees of the adjustment screws. These larger variations should be set up last.

(11) Reassemble as follows:

(*a*) Replace the setscrew wrench.

(*b*) Being extremely careful to see that the coupling pin on the compensator enters the coupling slot in the adjustment plate on the loop gear, reassemble the compensator assembly into the loop assembly.

(*c*) Replace the three mounting screws.

(*d*) Reconnect the four terminals.

(*e*) Taking care that the Neoprene gaskets are in place, replace the bottom cover plate. Apply Glyptal to the screws holding the cover plate and secure the cover plate to the base casting. Remount the loop on the aircraft in the same position as when the radio compass deviation calibration was made. Be sure to seal the structure and see that the index lines on the edge of the mounting plate are aligned with the fore and aft center line.

d. FLIGHT CHECK.

(1) Fly all or selected portions of the original course and record the data as in section II, paragraph 13.

(2) With "VAR" scale set for zero index, the bearing indicator pointer readings should agree with the figures in column 2, figure 2-4 and within ± 2.5 degrees for each directional gyro heading.

SECTION III
OPERATION

1. TO START AND STOP THE EQUIPMENT.

a. TO START THE EQUIPMENT.

(1) To start the equipment turn the function switch on remote control box to "COMP", to "ANT" or to "LOOP". (See figure 3-1.)

(2) In dual control installations push "CONTROL" switch to operate the green light. This shows that the remote control box is in control.

b. TO STOP THE EQUIPMENT.—To stop the equipment turn the function switch to "OFF."

2. OPERATION.

a. GENERAL.

(1) Set the radio control box switch to "COMP" or "ANT" position.

(2) Turn "LIGHTS" control clockwise.

(3) In dual control installations push "CONTROL" switch to operate the green light. The green light identifies whichever radio control box is in control.

Note

When the system employs Rectifier Unit RA-59-A, controlled by the power on-off relay in Relay BK-22-K assembly, it will be necessary to hold down the "CONTROL" button until the inverter builds up to rated output voltage when taking control away from a radio control box whose function switch is in the "OFF" position.

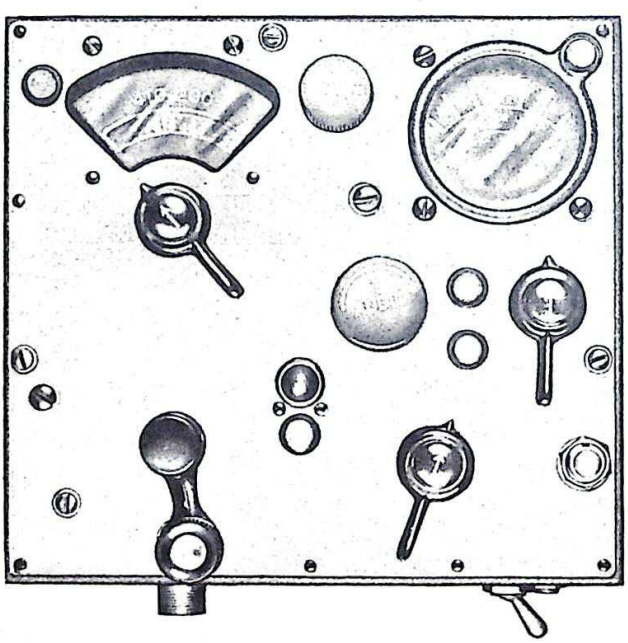


Figure 3-1. Radio Control Box ★C-4/ARN-7—Front View

(4) Rotate the bandswitch to the frequency band in which operation is desired.

(5) Turn "TUNING" crank to the desired station frequency in kilocycles, and rotate back and forth through resonance for maximum clockwise deflection of the tuning meter to determine the exact setting of the dial. Listen for station identification to be sure that the correct station is being received.

(6) Radio Compass ★AN/ARN-7 provides for aural identification of keyed CW stations by means of internal modulation controlled by the "CW-VOICE" switch. Switch to "CW" when this type of operation is desired.

b. HOMING COMPASS OPERATION.—For homing operation perform the operations as follows:

(1) Set function switch to "COMP".

(2) In dual control installations push "CONTROL" to gain control of receiver.

(3) Rotate the bandswitch to the frequency band in which operation is desired.

(4) Turn "TUNING" crank to the desired station.

(5) Turn the "VAR" knob on Indicator I-82-A (Navigator's) until the azimuth zero is at the index. Indicator I-81-A (Pilot's) is effectively in this position at all times.

(6) Apply rudder in the direction shown by the indicator pointer. When the indicator pointer is at zero, the aircraft is headed toward the radio station. The indicator pointer always points toward the radio station. If the pointer is to the right of zero, the station is to the right of the heading of the aircraft.

(7) Adjust "AUDIO" or interphone control for satisfactory headset level.

(8) Since in "COMP" operation the equipment has an excellent automatic volume control action, it is not practical to home on a radio range course and fly aurally at the same time.

(9) The homing operation of Radio Compass ★AN/ARN-7 is such that the aircraft will ultimately arrive over the radio station antenna, regardless of probable drift due to cross wind. However, the flight path will be a curved line, and coordination with ground fixes or landing fields along the route may be either difficult or impossible. It is often best to fly a straight line course or by off-setting the heading of the aircraft to compensate for wind drift. To do this, de-

termine the wind drift either with the drift sight or note the change in magnetic compass reading over a period of time. While homing with the radio compass a decreasing magnetic bearing indicates a wind from the left; an increasing magnetic bearing indicates a wind from the right. By trial and error, find the correct upwind radio compass angle, as shown by the indicator pointer, giving the minimum rate of change of magnetic compass reading. The scale on the indicator shows the deviation of the heading of the aircraft from the direction of the radio station directly in degrees.

c. POSITION FINDING.

(1) VISUAL METHOD.—For operation as an automatic visual indicating position finder, perform the operations as follows:

(*a*) Set the radio control box switch to "COMP."

(*b*) Tune in desired station.

(*c*) Prior to making fix determinations, the stations to be used should be located on the map, tuned in, identified, and the dial reading logged. This procedure avoids delay and error at the time of obtaining the fix.

(*d*) For greatest accuracy, take several bearings in rapid succession. This eliminates errors caused by the distance traveled between bearing observations. Bearings cannot be accurate unless the aircraft is held on a steady heading.

(*e*) Adjust "AUDIO" or interphone control for desired headset level.

(*f*) Set the azimuth scale with the "VAR" knob on Indicator I-82-A (Navigator's), so that the numerical value of the magnetic heading of the aircraft is at the index.

(*g*) Determine the magnetic variation for the locality over which the plane is flying and rotate the "VAR" knob for the required correction in the direction indicated by the arrows. The knob is marked with arrows to show the proper direction of rotation to compensate for east or west variation.

(*h*) Record the bearing shown by the tail end of the bearing indicator pointer. (This will be station-to-aircraft bearing from north.)

(*i*) To obtain a fix, take bearings on three or more stations 30 degrees or more from the line of direction of any one station and plot them on a map. The intersection of the plotted lines is the position of the aircraft at the time of observation.

(*j*) If the instructions in section II, paragraph 13, have been followed, the radio compass deviation in this equipment is automatically compensated for and need not be considered when taking bearings.

(2) AURAL-NULL METHOD.

(*a*) Switch to "LOOP," push "CONTROL" switch to obtain green light, and tune in desired station. To obtain a good intelligible signal when listening for station identification, it may be necessary to rotate the loop to a maximum signal position by means of the "LOOP L-R" switch on the control box. It is also necessary to turn "CW-VOICE" switch to "CW" in order to identify keyed stations.

(*b*) Adjust "AUDIO" or interphone control for desired headset level.

(*c*) Use the "VAR" knob on Indicator I-82-A (Navigator's), and set the bearing scale so that the numerical value of the magnetic heading of the aircraft is at the index mark.

(*d*) Determine the magnetic variation for the locality, and rotate the "VAR" knob in the direction indicated by the arrows for the required correction. The knob is marked with arrows to show the proper direction of rotation to compensate for east or west variation.

(*e*) Use the "LOOP L-R" switch and rotate the loop for minimum headset volume and read the bearing indicator. If the signal null exists over too wide an angle, greater accuracy may be obtained by rotating the "AUDIO" knob fully clockwise and locating the null by either listening for the disappearance of the audio signal or noting the dip in tuning meter deflection. *The use of "CW" operation also decreases the width of the null indication.*

(*f*) Record the bearing shown by the tail end of the bearing indicator pointer. Bearings are subject to 180-degree ambiguity.

(*g*) Fixes may be obtained as by the visual method, except that the 180-degree ambiguity must be resolved by the following method. Roughly, draw lines from the positions of the radio stations at the approximate angles indicated by the bearings obtained using arrows to show the directions in which the lines are drawn from the stations. Extend the lines until they meet. If all arrows point to the intersection, the position is correct and bearings may be plotted accurately; if not, first retake those bearings whose arrows point away from the intersection, rotating the loop to approximately 180 degrees from its original position.

d. RECEIVER OPERATION.

(1) ANTENNA RECEPTION.

(*a*) Set switch to "ANT" and adjust the interphone knob or the "AUDIO" knob of the Radio Control Box ★C-4/ARN-7 for satisfactory headset volume.

(*b*) For the best definition of radio range signals (between 200 and 420 kc), *set the interphone control fully clockwise,* and adjust the "AUDIO" knob for the lowest usable headset volume.

(2) LOOP RECEPTION.

(*a*) If reception on antenna is noisy because of precipitation static, commonly known as rain or snow static, loop reception may be employed for possible better results. Turn function switch to "LOOP" position. Depress "LOOP L-R" knob and turn to "L" or "R", holding until maximum signal strength is obtained. Adjust the "AUDIO" knob for desired headset volume. To rotate loop at slow speed, do not depress

"LOOP L-R" knob when turning it to "L" or "R".

(*b*) For the best definition of radio range signals on "LOOP", it is necessary to maintain the loop near the 90- ar 270-degree position. *Set the interphone control fully clockwise,* and adjust the "AUDIO" knob for the lowest usable headset volume.

Note

Cone of silence indications with "LOOP" receiver operation depend on the particular type of range transmitting antenna and the mounting of the loop on the aircraft. Such indications are not always reliable. In some cases, an increase, instead of decrease, in signal strength will be noted.

e. SUMMARY OF PRECAUTIONS DURING OPERATION.

(1) For aural reception of A-N signals, operate the equipment on "ANT" or "LOOP", instead of "COMP" since the action of the AVC in the "COMP" position will cause broad course indications.

(2) For best definition of A-N signals on "ANT" or "LOOP" set the "AUDIO" control to the lowest usable audio level and reduce it as A-N signals increase.

(3) During periods of precipitation static, operate on "LOOP". For best reception rotate the loop until a maximum signal is obtained.

(4) To obtain proper course definitions for aural reception of A-N signals on interphone, it is essential to set the interphone volume control fully clockwise and use the "AUDIO" control on the radio compass control box to reduce headset volume.

(5) To disconnect the radio compass from the interphone, plug the headset cord, Cord CD-307-A, directly into the jack on the radio control box having control. This operation allows the compass to be operated independently of the interphone system, and is especially desirable in installations which have the radio compass and another receiver on the same interphone switch position.

(6) When determining direction on "LOOP" by aural-null method, there is a 180-degree ambiguity, and the direction of the station may be 180 degrees from the null obtained. The broadness of the null with aural-null direction finding depends on the strength of the signal. Strong fields produce very sharp nulls, sometimes as small as one-tenth degree. Vary the "AUDIO" control until the null is of satisfactory width. The tuning meter may be used as a visual null indicator.

(7) LOOP OPERATION.

(*a*) If the loop is in the null position when flying on a radio range course, the signal may fade in and out and possibly be mistaken for a cone of silence.

(*b*) Cone of silence indications are not reliable on loop type radio range stations when the radio compass is operating on "LOOP". The signal may increase in volume to a strong surge instead of indicating a silent zone when directly over the station.

(8) Select radio stations that provide stable bearings. Tune the equipment carefully. If an interfering signal is heard in the headset, it is probably causing an error in bearing. To check, tune a few kilocycles either side of resonance. A change in bearing, while tuning, indicates an interfering signal. If station interference exists, select another station, or proceed by other means of navigation until closer to the desired station. Be careful when taking bearings on stations broadcasting the same program as they may be mistaken for each other. Avoid taking bearings on synchronized stations except when close to the desired station. If the radio station stops transmitting or fades, (especially code stations operating in a network) bearings are probably being taken on other stations of the same frequency, and thus causing errors.

IMPORTANT

Do not use a station for bearings unless it can be identified by the headset signal on "COMP" operation.

(9) Check the dial calibrations against actual station frequencies. If the calibration is wrong, report the defect.

(10) When homing, fly the plane with the indicator pointer at zero or fluctuating equally, slightly left and right.

IMPORTANT

Do not depend on the tuning meter as a distance meter. Do not disturb any internal adjustments.

(11) Night effect, or reflection of the radio wave from the sky, is often present. It may be recognized by a fluctuation in bearings. The remedy is:

(*a*) Increase altitude, thereby increasing the strength of the direct waves.

(*b*) Take an average of the fluctuations.

(*c*) Select a lower frequency station.

(12) Night effect is worst at sunrise and sunset. Night effect may be present on stations at 1750 kc at distances greater than 20 miles. As the frequency decreases, the distance of the usable direct wave increases until at 100 kc the distance will be about 200 miles. Satisfactory bearings, however, will often be obtained at much greater distances than stated above, and unsatisfactory bearings may sometimes be obtained at short distances.

(13) When close to a station, accurate bearings cannot be taken with the aircraft in a steep bank. This is especially applicable to reception of signals from instrument landing trucks.

(14) Only head-on bearings are entirely dependable. If side bearings are taken, keep the wings horizontal.

(15) Do not depend on two stations for a fix of location; use at least three station bearings. In general,

a set of stations with bearings spaced at approximately equal intervals throughout 360 degrees will give best accuracy.

(16) This equipment should provide compass bearings during conditions of moderate precipitation static which interrupt normal reception. On occasions where severe precipitation static is present, especially when discharges occur from parts of the aircraft surfaces, it will be necessary to operate on "LOOP" position. In this position, satisfactory reception and aural-null direction finding will be possible most of the time. Avoid precipitation static existing in air mass fronts at different temperatures by crossing the air mass front at right angles and then proceed on the desired course instead of flying along the air mass front.

(17) False or fluctuating bearings in some instances are produced by reflection of radio waves from the surface of mountains. This is called *mountain effect,* and is known to exist under certain circumstances in the vicinity of Pittsburgh and Salt Lake City. Because of this effect, do not rely fully upon bearings taken when flying over mountainous terrain.

(18) When receiving modulated signals, intelligibility is greatly reduced if the "CW-VOICE" switch is on "CW".

SECTION IV
EMERGENCY REPAIR

1. FLIGHT ADJUSTMENTS.

a. If unsatisfactory operation is encountered in flight, it is often possible to restore normal operation in a very short time if a systematic check of the most likely causes of failure is made. Make the following checks in the order given:

(1) Check the vertical antenna lead-in and see that it is not grounded or has an open circuit.

(2) Check the loop cable plug for tightness.

(3) Insert the headset plug in the phone jack of radio control box in control. If nothing is heard, try another pair of headsets.

(4) Observe the instrument lights on the control box which is in control. If these lights are off, push the control switch. If the lights come on, the control box had not been in control. However, if the lights remain off, push the control switch again and check a-c and d-c fuses in Relay BK-22-K.

(5) Switch to the "ANT", "LOOP", and "COMP" positions and check for normal operation on these positions.

(6) Observe the tuning meter. If the pointer is at the extreme right-hand position, there is probably no plate voltage on the second detector tube. If the pointer looks normal, plate voltage is probably normal.

(7) Switch to each band one at a time checking in the "ANT", "COMP", and "LOOP" position for normal operation.

(8) Switch to the other radio control box and repeat paragraphs (4) through (7) this section.

(9) Remove the compass from its case and make sure that all tubes are seated properly.

(10) All tubes should be warm if they are operating properly.

(11) If any of the tubes feel cold, replace with new tubes, if available.

(12) Check all grid leads to tube caps to make certain none are shorting to ground or are open circuited.

b. If the trouble is still not located after performing checks (1) through (12) this section, it is probable that the trouble is of such a nature that it cannot be fixed in flight. If this is true, report the equipment as inoperative and submit it to the proper personnel for repair.

SECTION V
SUPPLEMENTARY DATA

TABLE 5-1. TUBE COMPLEMENT

Reference Symbol	*Stock No.*	*Type Designation*		*Function*
		JAN	*VT*	
VT-66		JAN-6F6	VT-66	Audio output amplifier
VT-66		JAN-6F6	VT-66	Cathode follower
VT-74		JAN-5Z4	VT-74	High voltage rectifier
VT-86		JAN-6K7	VT-86	1st r-f amplifier
VT-86		JAN-6K7	VT-86	2nd r-f amplifier
VT-86		JAN-6K7	VT-86	I-F amplifier
VT-86		JAN-6K7	VT-86	Loop stage amplifier
VT-87		JAN-6L7	VT-87	1st detector
VT-93		JAN-6B8	VT-93	2nd detector A-F amplifier AVC
VT-93		JAN-6B8	VT-93	Compass output Amp. loop AVC
VT-94		JAN-6J5	VT-94	R-F oscillator
VT-96		JAN-6N7	VT-96	A-F oscillator
VT-105		JAN-SC7	VT-105	Modulator
VT-109		JAN-2051	VT-109	Loop control
VT-109		JAN-2051	VT-109	Loop control

TABLE 5-2. FUSE COMPLEMENT*

Type No.	*Stock No.*	*Current Rating*	*Location*
3AG		1/8 amp.	Radio Compass Unit ★R-5/ARN-7

* Spares are not supplied.

TABLE 5-3. PILOT LAMP COMPLEMENT

Type Designation	*Stock Number*	*Location*
Special, ARL Drawing No. SC-B-2193-G		Panel, Radio Control Box ★C-4/ARN-7

TABLE 5-4. AMERICAN AND BRITISH TERMINOLOGY GLOSSARY

United States	*British Equivalent*	*Definition*
Antenna	Aerial	A conductor consisting of a wire supported in the air for directly transmitting or receiving electrical waves.
Aircraft	Aircraft	Any weight-carrying device designed to be supported by the air, either by buoyancy or by dynamic action. In Britain used only as a collective plural and in the United States, as either a singular or a collective plural.
Airplane	Aeroplane	A mechanically driven aircraft, heavier than air, fitted with fixed wings and supported by the dynamic action of the air.
Battery, storage	Storage battery or accumulator	A battery of leakproof design which will not discharge its liquid contents during violent maneuvers.
Beacon, radio range	Radio track beacon	A radio transmitter supplying directive radio waves that provide a means of keeping aircraft on the proper course.

United States	*British Equivalent*	*Definition*
Conduit or electrical tubing	Conduit	A tube for receiving and protecting electric wires or cables.
Controls, air, cable, or flight	Flying controls	The means employed to operate the control surfaces of an aircraft.
Copilot	Second pilot	The assistant to the pilot of an aircraft.
Course	Track angle	The direction over the surface of the earth, with respect to true north, which an aircraft flies.
Direction finder radio, or automatic direction finder	Radio direction finder (R.D.F.), radio compass, or steering director	A radio instrument which, if once tuned to a station points continuously and automatically to the station.
Documents, classified	Protected papers	All documents which are classified for protection to a greater or lesser degree from the general public.
Drift	Drift-angle	The angle between the heading and the track.
Engine	Aero-engine	An engine used to provide the motive power for an aircraft.
Field, landing	Landing ground	A field of such a size and nature as to permit of aircraft landing and taking off in safety.
Gasket	Gasket, joint, or washer	A sheet or ring of packing used for engine heads, pipe joints, and similar purposes.
Generator	Generator or dynamo (obsolescent)	A machine by which mechanical energy is changed into electrical energy.
Ground	Ground or earth	The connection made in grounding an electrical circuit.
Gyro-directional or directional indicator	Directional gyro, direction indicator, or gyroscopic turn indicator	An instrument employing a gyroscope for indicating any change in the direction of the aircraft in azimuth from a straight course.
Heading	Course	The angular direction of the longitudinal axis of an aircraft with respect to true north.
Interphone	Intercommunication or intercom (slang)	A system of communication between different stations on the same aircraft.
Inverter	Motor generator (d.c. to a.c.)	A motor coupled to a generator for transforming electric currents.
Left	Port	Situated to the left, looking in the direction of motion of an aircraft.
Loop, radio or loop antenna	Loop aerial	A specified number of turns of wire located in the wings or wound around the fuselage of an airplane. Small portable loops on a rectangular frame are also used.
Mast, radio	Rod aerial	A mast attached to an aircraft which serves as part of the radio antenna structure.
Meter, drift or drift indicator	Drift sight	An instrument for measuring the drift angle.
Mile, sea	Sea mile or admiralty mile	A measure of distance equal in the United States to 6080.20 feet and in Britain to 6080 feet. One knot is one sea mile per hour.
Navigation, air or aerial navigation	Avigation	The guidance of craft through the air in accordance with previous calculations. "Avigation" has been used, but is considered unnecessary, in the U. S.
Nut, self-locking or Elastic stop nut (trade name)	Self-locking nut or Simmonds nut (trade name)	A nut so constructed that it locks in place when tightened.
Operator, radio	Wireless operator	The operator of a radio sending and receiving set.
Plug or attachment plug	Plug	A removable male fitting for making electrical connections by insertion in a receptacle or body.
Post, binding	Terminal	A metallic post attached to the electrical apparatus for convenience in making connections.
Radio	Wireless	A device for the transmission or reception of signals by means of electric waves.
Radio, directional	Direction finder or directional wireless	Equipment for finding the azimuth of a distant transmitter.
Right	Starboard	Situated to the right, looking in the direction of an aircraft.

United States	*British Equivalent*	*Definition*
Screw, fillister	Cheese-headed screw	A screw whose head is cylindrical and slotted with a convex or flat top.
Setscrew or headless setscrew	Grub screw	A headless machine screw screwed through one part tightly upon another part to prevent relative movement.
Shield or screen (ignition)	Ignition harness or screening	A device which protects other electrical apparatus from being affected by magnetic fields set up by the ignition system.
Socket, plughole or jack	Socket	A fixed female fitting for making electrical connections by the insertion of a plug.
Track or course	Track	The projection of the path of the center of gravity of an aircraft onto the earth's surface.
Tube	Valve	A radio electron tube.
Wrench	Wrench or spanner	An instrument for exerting a twisting load, as in turning bolts or nuts.
Wire, safety or lock wire	Safety wire or lock wire	A wire used to secure a small part so that it cannot loosen.

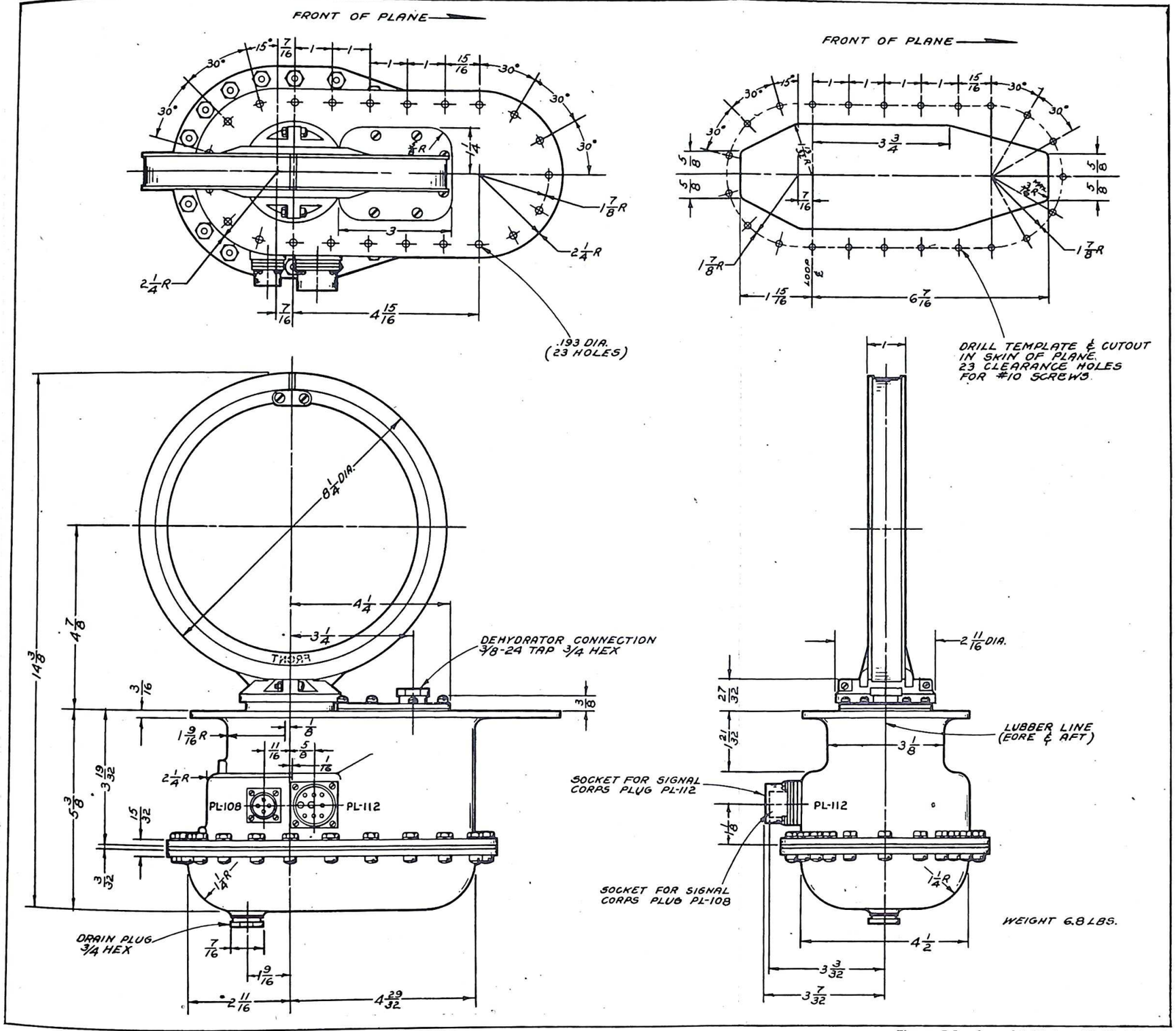


Figure 5-1. Loop LP-31-A or LP-31-AM—Outline Drawing

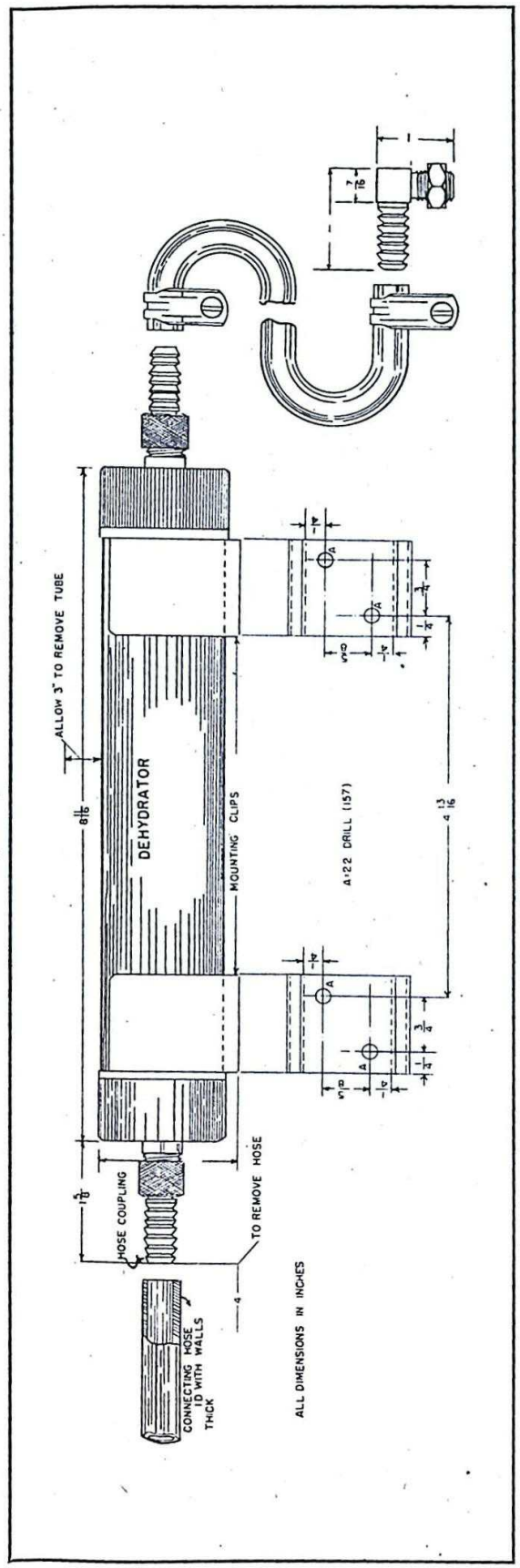


Figure 5-2. Loop Dehydrator—Outline Drawing

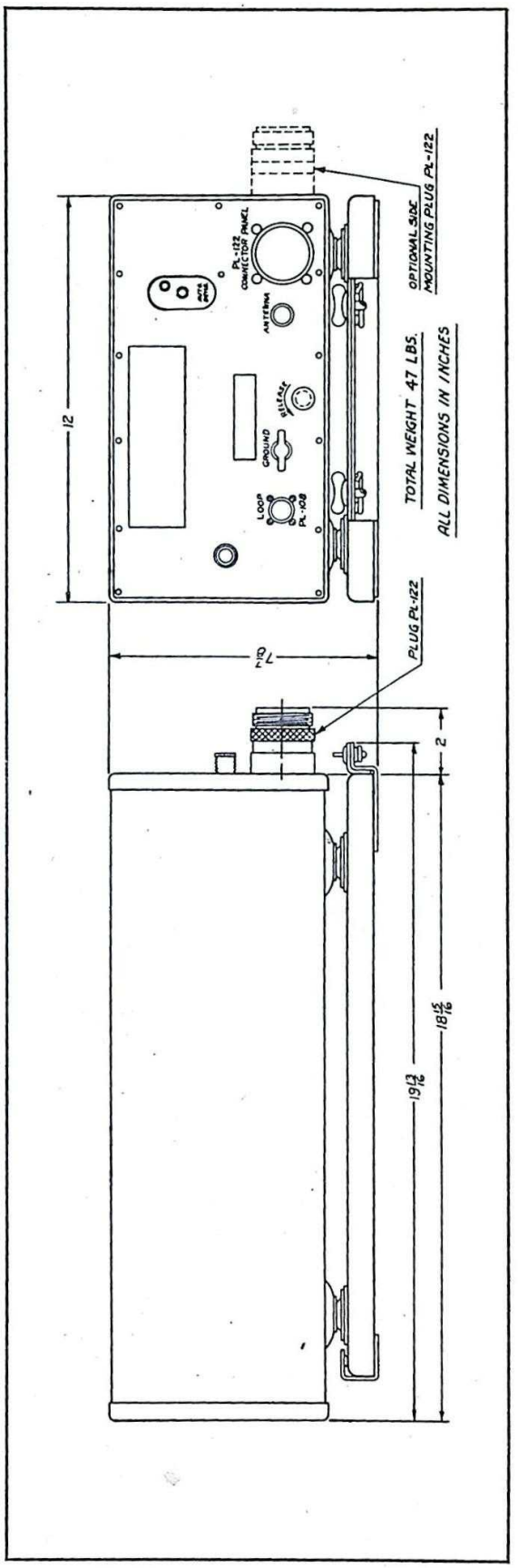


Figure 5-3. Radio Compass Unit ★R-5/ARN-7—Outline Drawing

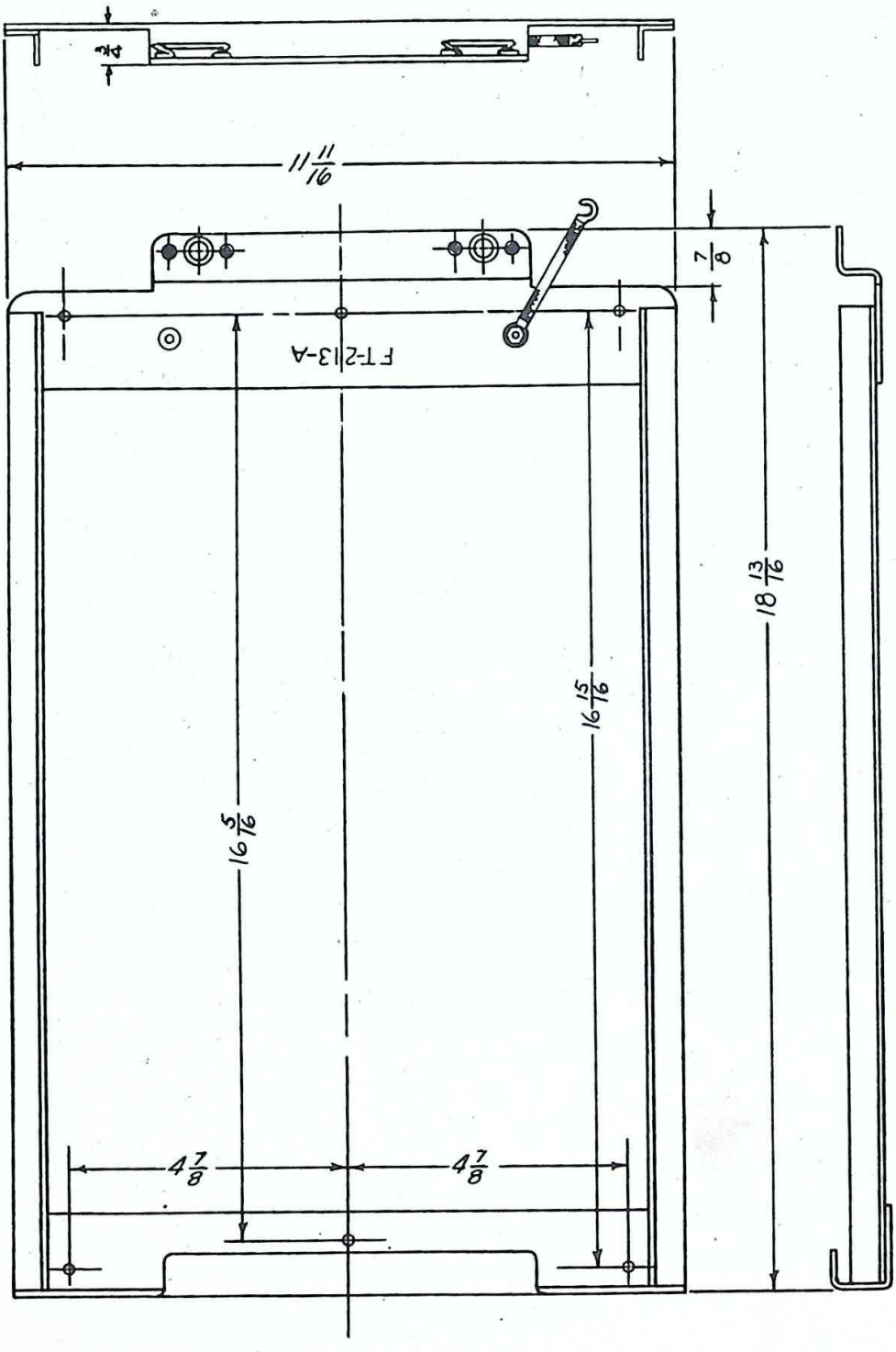


Figure 5-4. Mounting FT-213-A—Drilling Plan

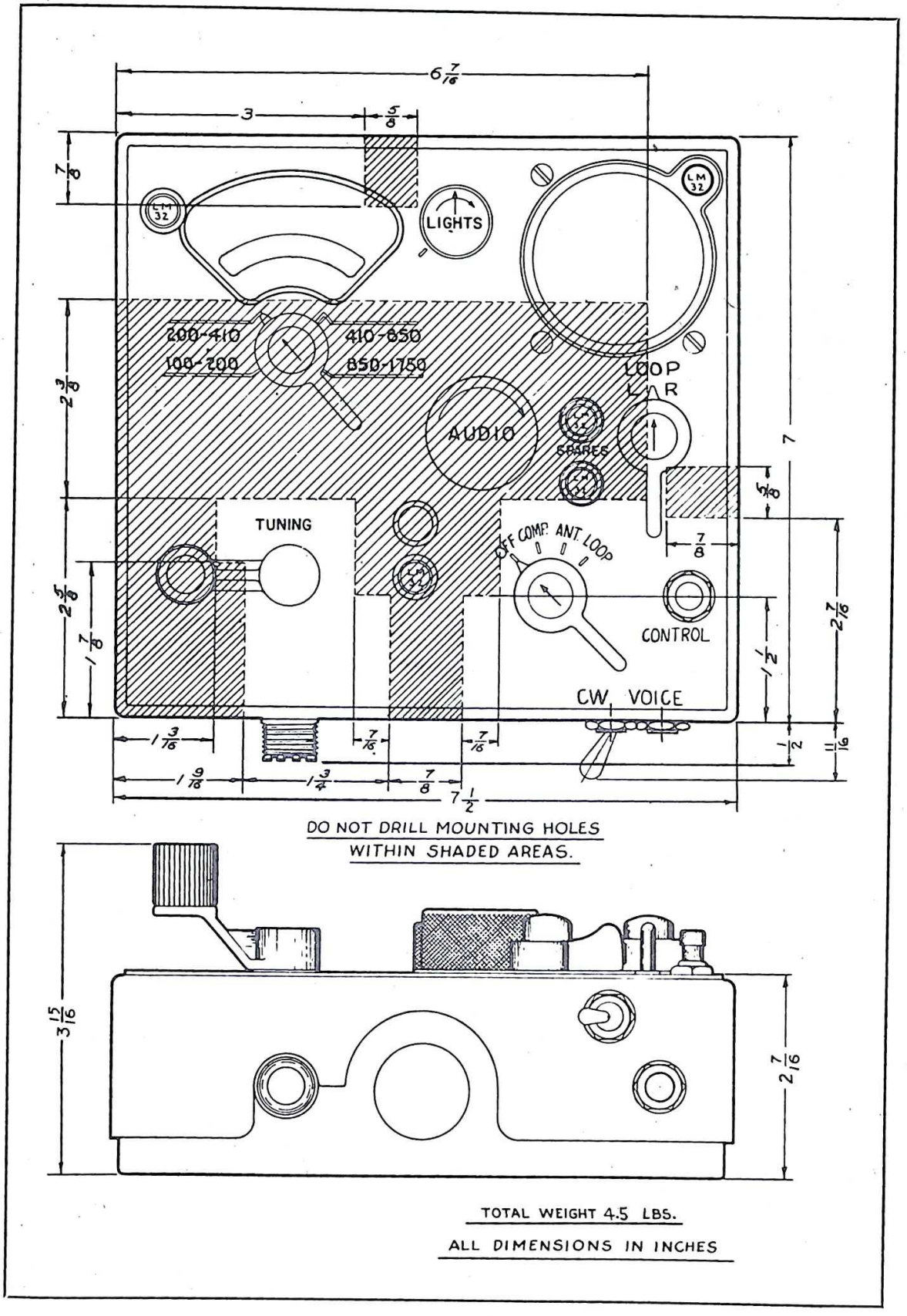


Figure 5-5. Radio Control Box ★C-4/ARN-7—Outline Drawing

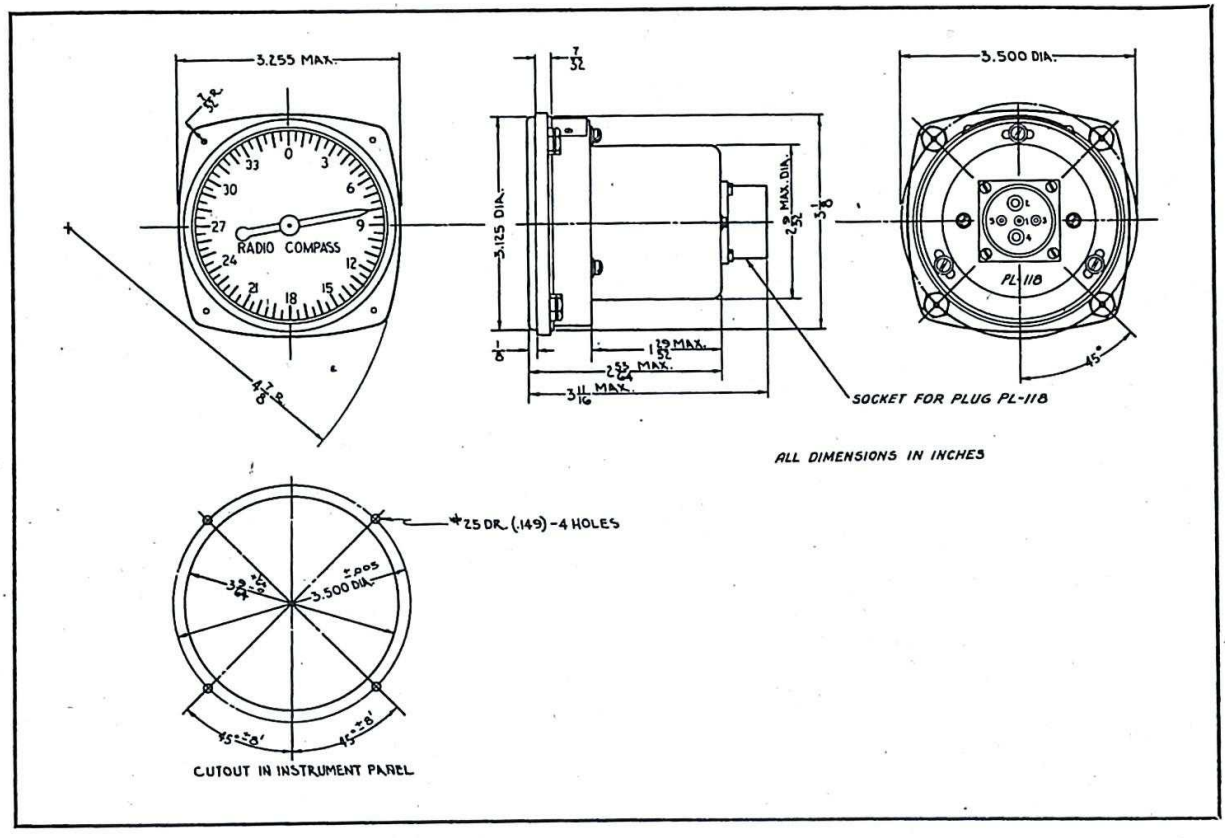


Figure 5-6. Indicator I-81-A (Pilot's)—Outline Drawing

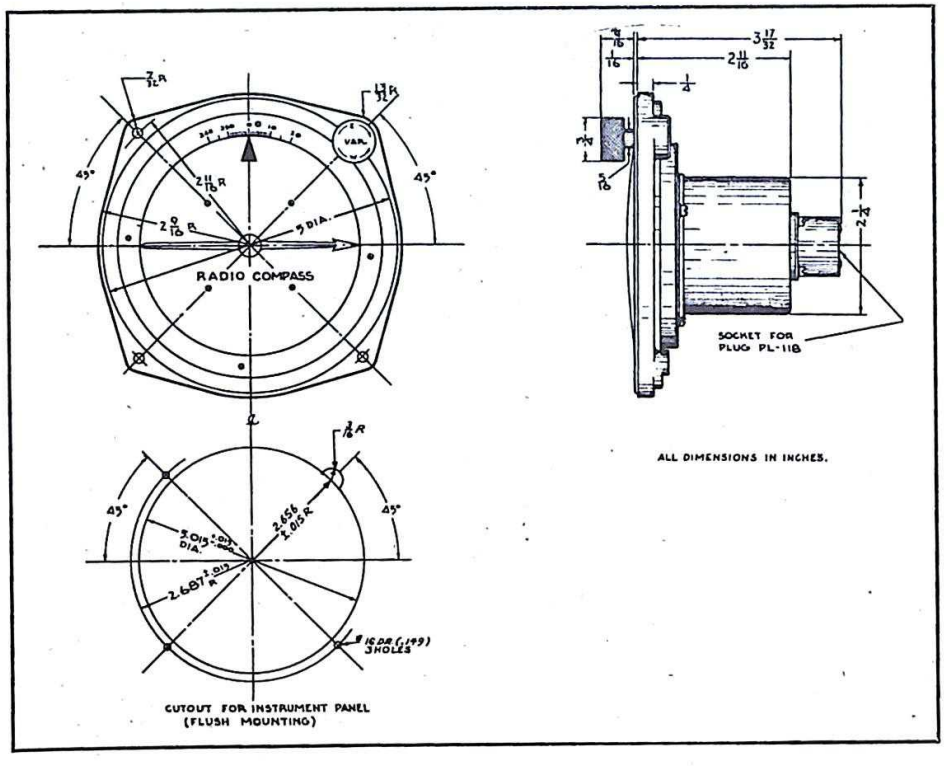


Figure 5-7. Indicator I-82-A (Navigator's)—Outline Drawing

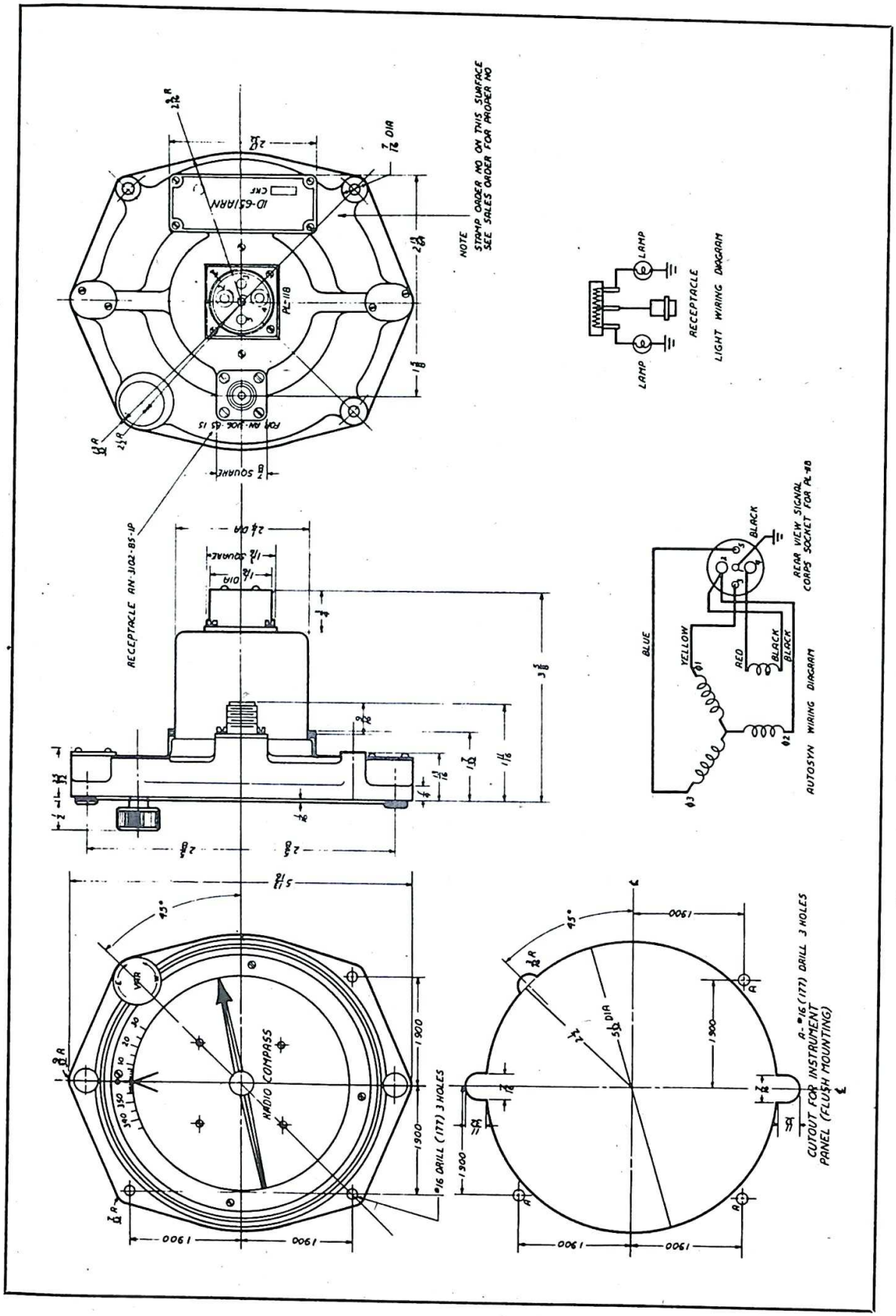


Figure 5-8. Indicator ID-65/ARN (Navigator's)—Outline Drawing

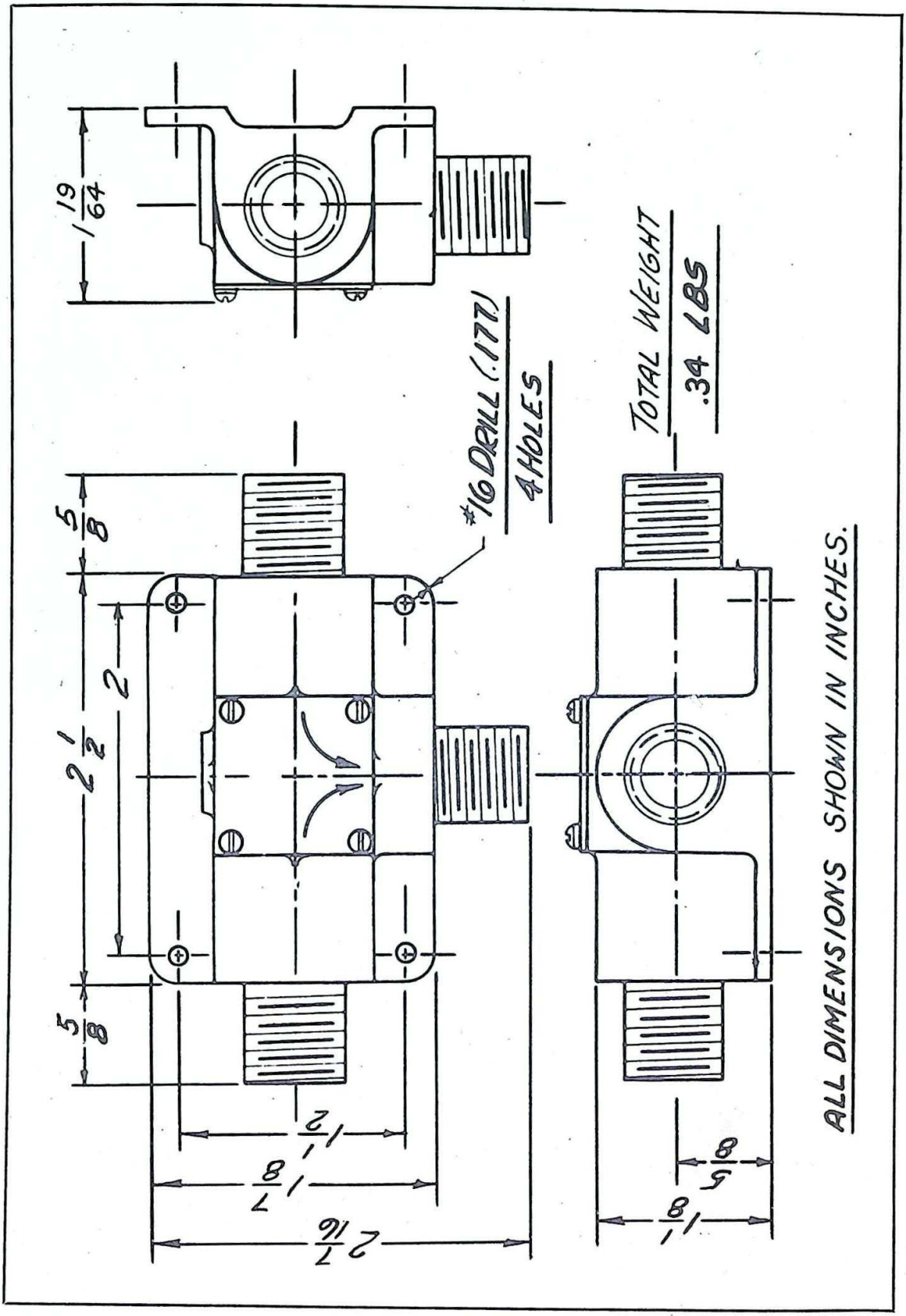


Figure 5-9. Coupling MC-203-A—Outline Drawing

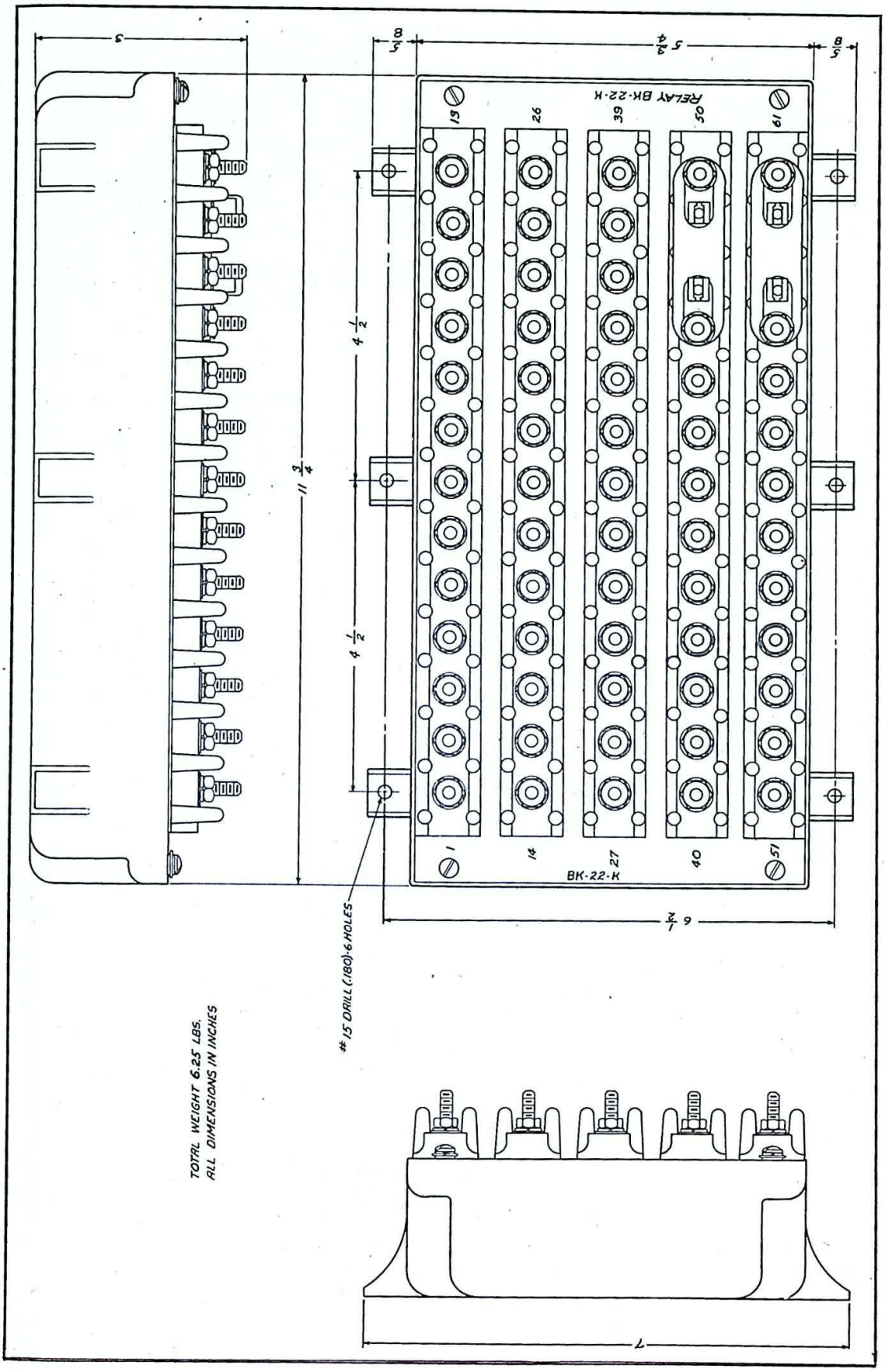


Figure 5-10. Relay BK-22-K—Outline Drawing

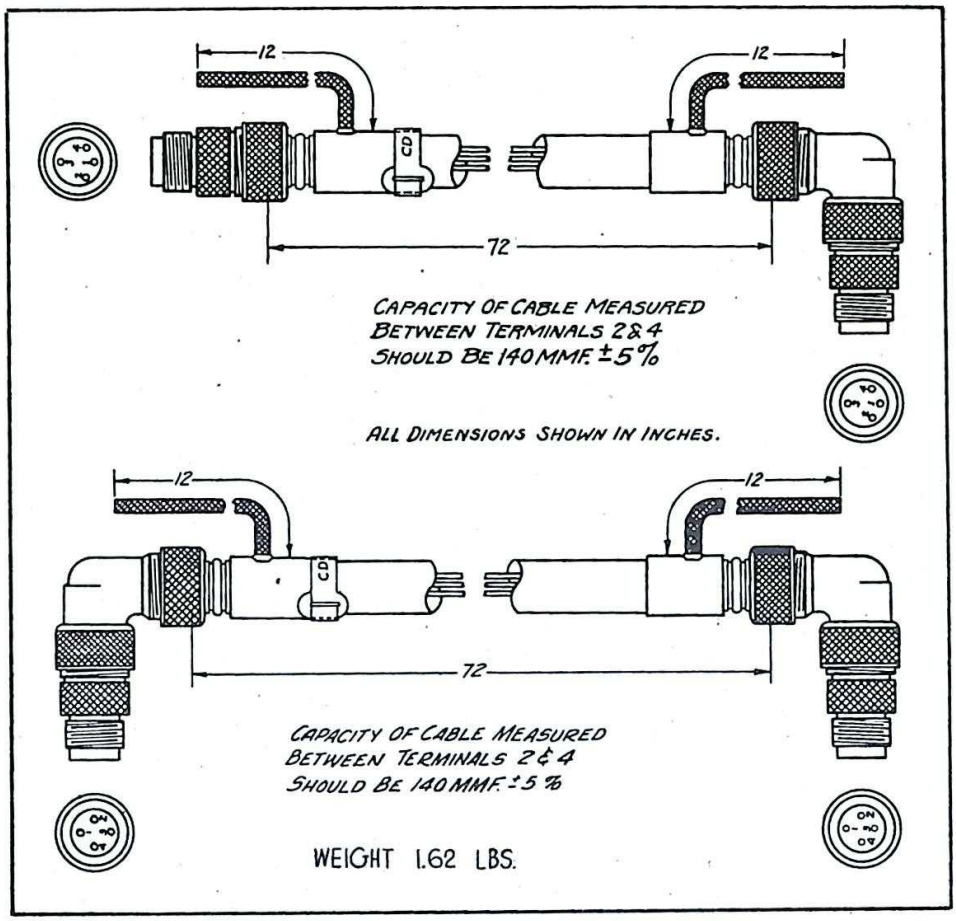


Figure 5-11. Cord CD-365 and CD-365-A—Outline Drawing

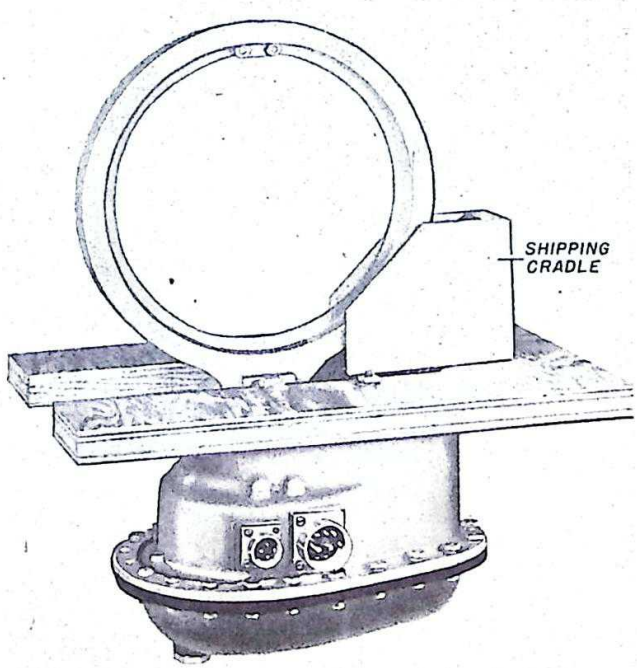
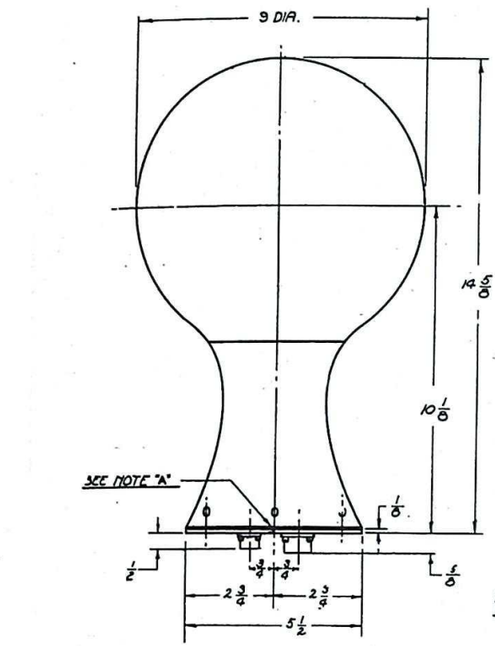
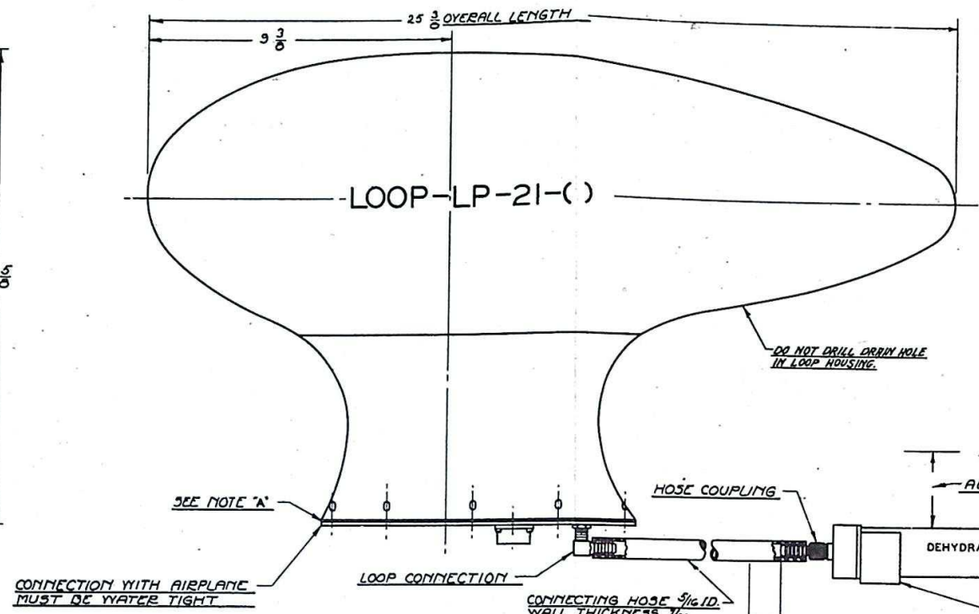
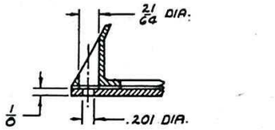


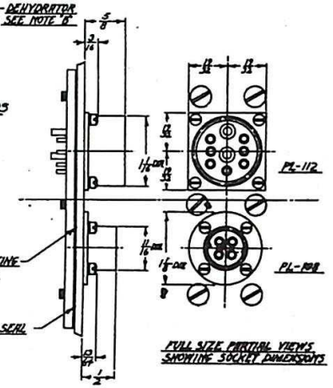
Figure 5-12. Loop LP-31-A or LP-31-AM—Wooden Shipping Cradle in Place



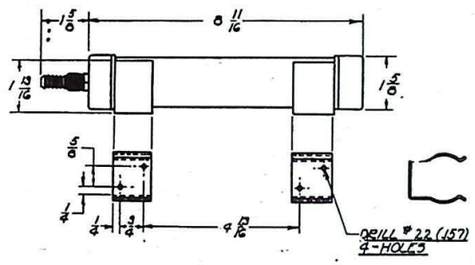




TYPICAL SECTION THROUGH 8 HOLES

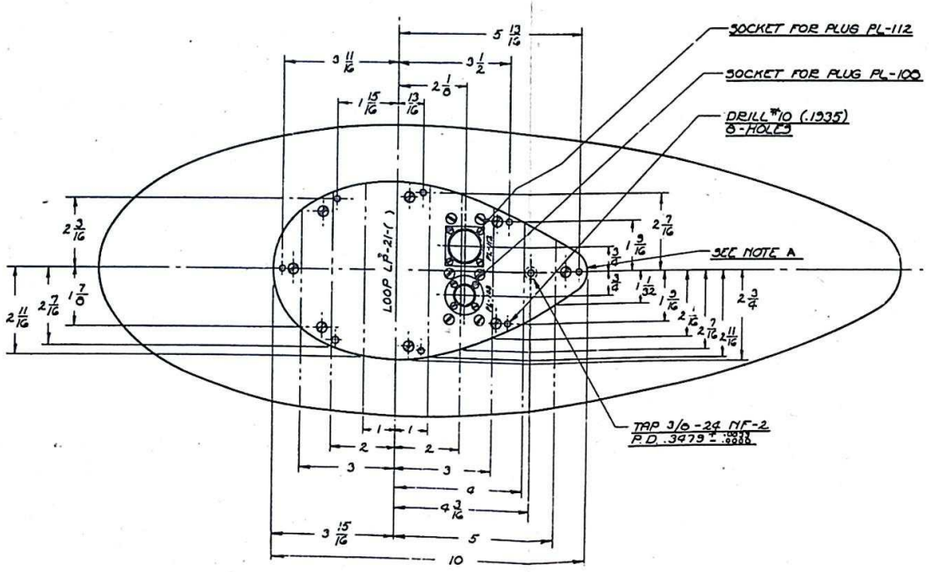


FULL SIZE PARTIAL VIEWS SHOWING SOCKET DIMENSIONS



VIEW SHOWING DEHYDRATOR MOUNTING DIMENSIONS

TOTAL WEIGHT 11.7 LBS.



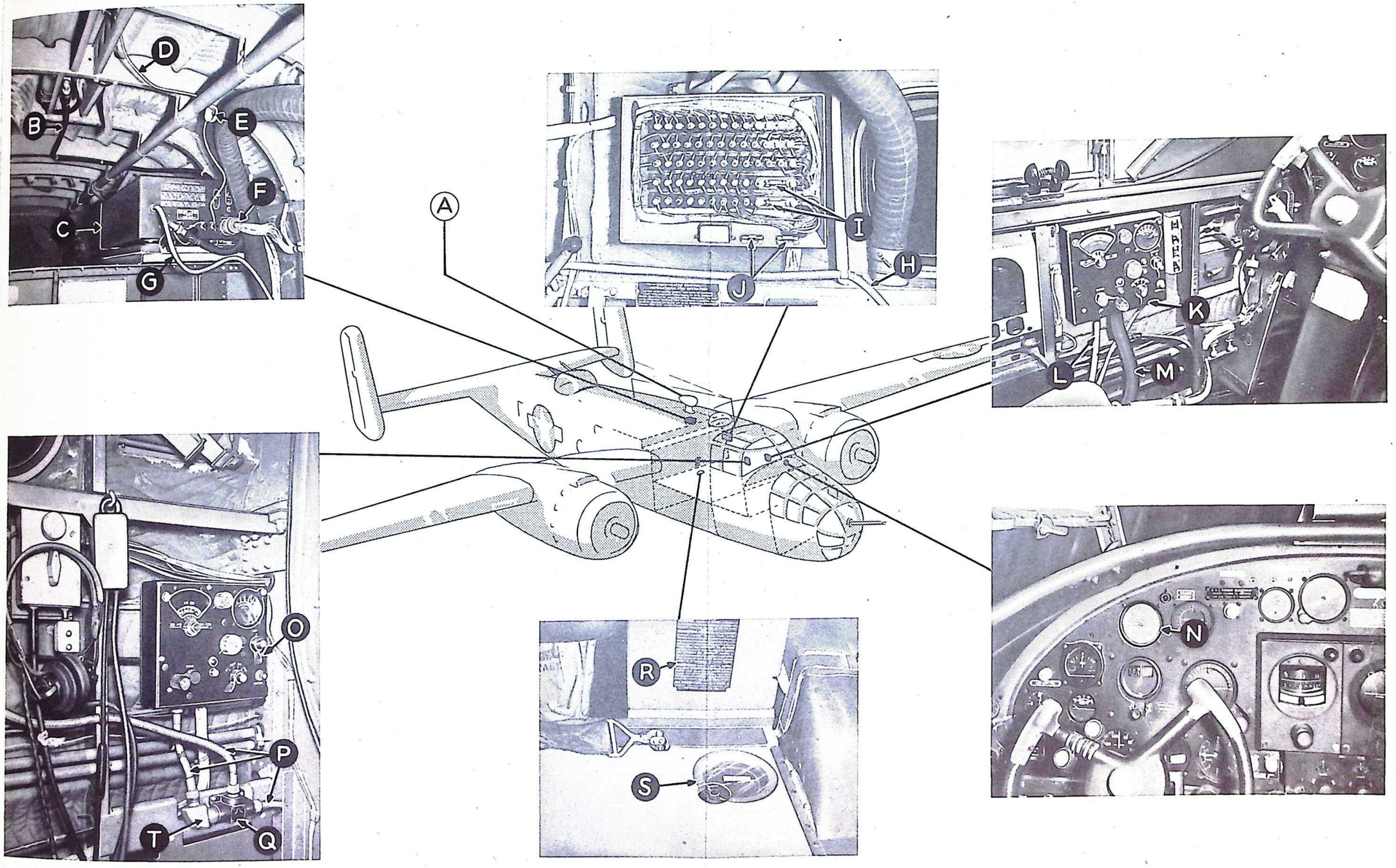
NOTE "C" QUADRANTAL ERROR CALIBRATION SHALL BE SET-UP ON EACH LOOP LP-21-( ) AND LABELED "CALIBRATED FOR (TYPE AIRPLANE)" IN A PLACE VISIBLE FROM OUTSIDE OF AIRPLANE.

NOTE "B" DEHYDRATOR IS PART OF LOOP LP-21-( ) & SHALL BE INSTALLED SO AS TO BE VISIBLE TO A CREW MEMBER PERIODICALLY THE RADIO OPERATOR, AND SHALL BE MOUNTED WITH BREATHER END DOWN. REMOVE SEAL ON THE BREATHER END.

NOTE "A" CENTER LINE TO BE MARKED ON FRONT & REAR EDGE OF MOUNTING PLATE LINE THRU THESE TWO POINTS TO COINCIDE WITHIN ±0.5 DEGREE OF NULL POSITION OF LOOP

CENTER LINE OF LOOP TO BE PARALLEL TO CENTER LINE OF SHIP WITHIN ±0.5 DEGREE

Figure 5-13. Loop LP-21-A, LP-21-AM or LP-21-LM—Outline Drawing



A. LOOP LP-21-A
B. CORD CD-365-
C. RADIO COMPASS UNIT
D. SENSE ANTENNA LEAD-IN
E. STAND-OFF INSULATOR
F. PLUG PL-122
G. TUNING SHAFT
H. TUNING SHAFT
I. FUSE (IN RELAY BK-22-K)
J. SPARE FUSES
K. PILOT'S RADIO CONTROL BOX
L. TUNING SHAFT
M. CABLING (WITH SHIELD)
N. PILOT'S INDICATOR
O. NAVIGATOR'S CONTROL BOX
P. TUNING SHAFT
Q. COUPLING MC-203-A
R. INSTRUCTION CHART
S. NAVIGATOR'S INDICATOR
T. COUPLING MC-136

Figure 5-14. Typical Installation of Radio Compass

WIRE TABLE

ALL WIRES TO BE AIRCRAFT CABLE PER SPEC AN-J-C-48 UNLESS OTHERWISE SPECIFIED.
+ INDICATES WIRES TO BE INDIVIDUALLY SHIELDED PER SPEC 35-27273.
⊗ INDICATES WIRES WHOSE VOLTAGE DROP MUST NOT EXCEED LIMITS OF SPEC 35-32310

REF NOTE	WIRE NO	MAXIMUM OPERATING VOLTAGE	MAX ALLOWABLE RESISTANCE IN OHMS (71°C)	MINIMUM AN SIZE PERMITTED	REF NOTE	WIRE NO	MAXIMUM OPERATING VOLTAGE	MAX ALLOWABLE RESISTANCE IN OHMS (71°C)	MINIMUM AN SIZE PERMITTED
	701	100	10	AN20		750	14	1	AN18
	702	225	10	AN20		751	30	.05	AN20
	703	100	10	AN20		752	30	.1	AN18
	704	25	10	AN20	7	753	14	10	AN20
	705	30	.1	AN20		754	0	.05	AN18
	706	30	1	AN20		755	115	.1	AN18
	707	30	1	AN20		756	115	.1	AN18
	708	5	10	AN20		757	14	.05	AN12
	709	31	.1	AN20		758	30	1	AN20
	710	30	.1	AN20		759	30	1	AN18
	711	108	1	AN20		760	115	.1	AN18
	712	30	.1	AN20		761	14	.1	AN12
						762	30	1	AN20
						763	100	10	AN20
	715	.08	1	AN20		764	30	.1	AN20
2	716	100	10	AN20		765	.08	.1	AN20
	717	25	10	AN20		766	108	.1	AN20
	718	30	1	AN20		767	30	.1	AN20
	719	30	1	AN20		768	30	1	AN20
	720	30	.1	AN20		769	20	1	AN20
	721	5	10	AN20		770	115	1	AN18
	722	31	1	AN20					
	723	0	1	AN20		779	25	1	AN20
	724	0	.1	AN20		780	25	1	AN20
	725	0	1	AN20					
	726	0	.1	AN20					
					7	786	0	.1	AN18
	728	108	.1	AN20	7	787	14	1	AN18
					7	788	225	10	AN20
					7	789	14	10	AN20
						790	0	.1	AN12
	739	25	1	AN20					
	740	30	.1	AN20		792	25	1	AN20
	741	25	1	AN20		793	50	1	AN20
	742	30	1	AN20		794	50	1	AN20
	743	20	1	AN20		795	50	1	AN20
	744	50	1	AN20		796	115	.1	AN18
	745	50	1	AN20		797	0	GROUND	GROUND
	746	50	1	AN20					
	747	30	.1	AN20		798	115	.05	AN12
	748	115	1	AN18					

NOTES-

8 WHEN INDICATORS I-81-(*) OR ID-65/ARN (ITEM ③) ARE MOUNTED ON AN UNGROUNDED STRUCTURE, CONNECT PIN 1 OF PLUG PL-118 TO SOME PART OF THE AIRPLANE OR THE RADIO EQUIPMENT WHICH IS AT GROUND POTENTIAL.

7 WHEN MARKER BEACON RECEIVING EQUIPMENT RC-193-(*) IS INSTALLED, DELETE ITEMS ⑧, ⑲, ⑳, ㉑, AND WIRES 753, 786, 787, 788, AND 789. SEE DRAWING H44D3438.

6 SHIELDED LEADIN FOR SENSE ANTENNA TO BE AS SHORT AS POSSIBLE AND IN NO CASE TO EXCEED 30 IN IN LENGTH AND 25 MMF IN CAPACITY. EXAMPLE 30 IN OF 1/2 IN OD ALUMINUM TUBING CONTAINING INSULATED SPACERS AND W-106 WIRE

5 MANUFACTURERS SHALL INDICATE TO WHICH POINTS ON ELECTRICAL WIRING DIAGRAM THESE CONNECTIONS ARE MADE

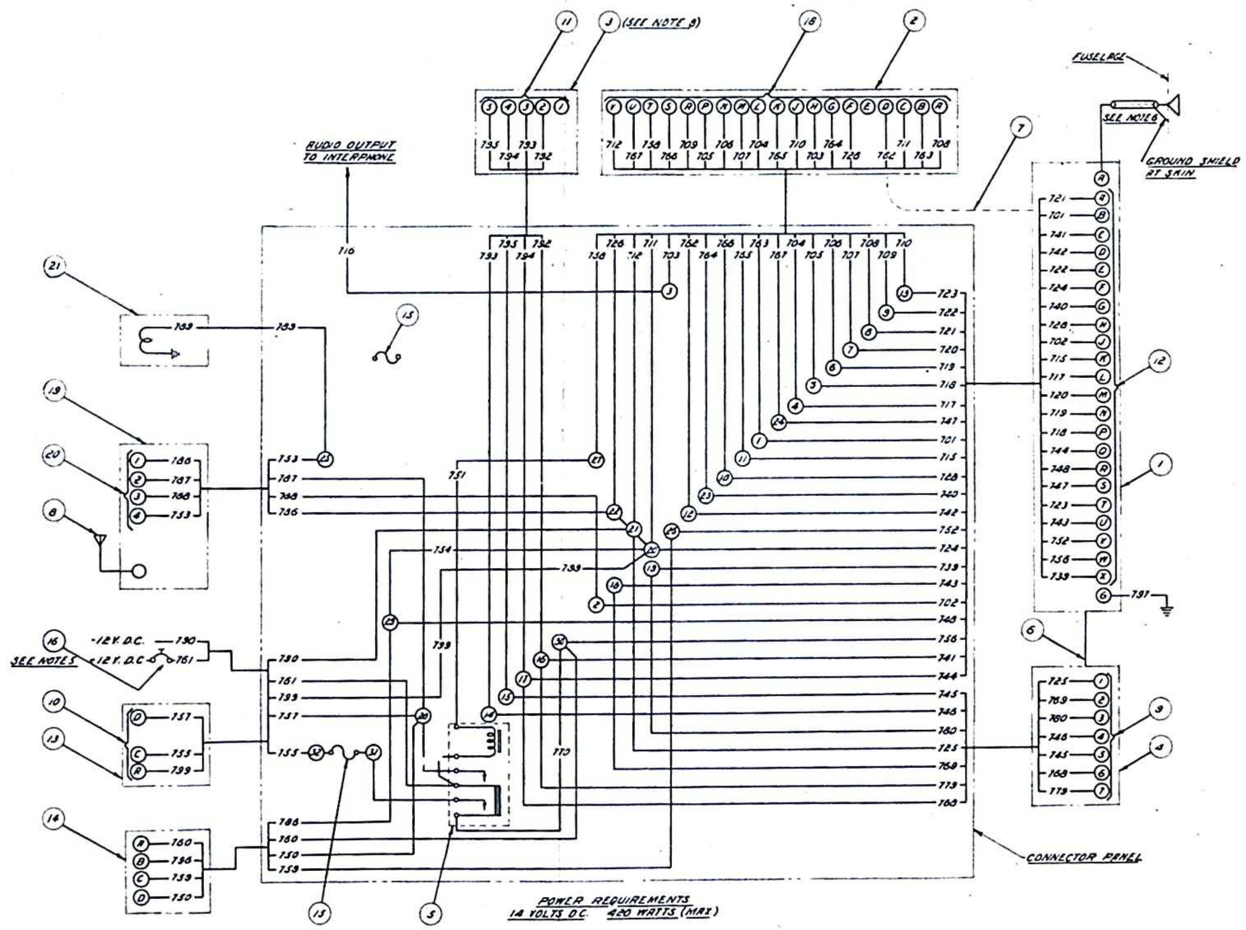
4 CONNECT WIRES 715, 725, 728, 745, 746, AND 769 AS SHOWN IN FIGURE 1. DIAGRAM SHOWS CONNECTIONS FOR TOP MOUNTING OF LOOP AND SENSE ANTENNA

3 CONTRACTOR SHALL PROVIDE THE MOUNTINGS FOR SPARE FUSES

2 INTERPHONE WIRE TO BE AWG #20, INDIVIDUALLY SHIELDED, PER SPEC 35-27273

1 ALL TERMINAL STRIPS REQUIRED IN ALL INSTALLATIONS OF THE WIRING SHALL BE MADE OF SUITABLE INSULATING MATERIAL AND WITH TERMINAL SPACING TO PROVIDE PROTECTION AGAINST VOLTAGE BREAKDOWN

9 WHEN CONTROL BOX (ITEM ②) IS MOUNTED ADJACENT TO A GUN OR GUN TURRET WHERE CONCUSSION OF GUN FIRE CAUSES EXCESS VIBRATION, THE CONTROL BOX SHALL BE SHOCK MOUNTED



COMPONENT TABLE

	ITEM	QUAN REQD	EQUIPMENT NOMENCLATURE: DESCRIPTION	EQUIPMENT NOMENCLATURE: TYPE NO	SPEC OR INSTALLATION DRAWING
*	1	1	RADIO COMPASS UNIT	*R-5/ARN-7	H4403878
*	2	1	RADIO CONTROL BOX	*C-4/ARN-7	H4403861
*	3	1	BEARING INDICATOR	[illegible]	[illegible]
*	4	1	LOOP	[illegible]	[illegible]
*	5	1	RELAY	SW-182-(*)	H4?83128
*	6	1	CORD (LOOP CONNECTING)	CD-365(*) OR CD-42.ARN	H4184650
*	7	1	TUNING SHAFT	MC-124	SC-D-2035
*	8	1	MARKER BEACON ANTENNA		H4052225
*	9	1	PLUG	PL-112	SC D-2219
*	10	1	PLUG	PL-Q-267	AN 3108 22-22S
*	11	1	PLUG	PL-118	SC D-3281
*	12	1	PLUG	PL-122	SC D-3305
*	13	1	INVERTER UNIT	PE-108-(*)	H4309273
	14	1	RECTIFIER UNIT	RA-59	H4307446
	15	2	FUSE 5 AMP (SPARE)		32271
	16	1	CIRCUIT BREAKER	AN-3161-P50	AN-C-77
*	18	1	MOUNTING CONTROL BOX	FT-224-(*)	H4403861
			MARKER BEACON	RC-39-B	
*	19	1	MARKER BEACON RECEIVER	BC-341-(*)	H4161 0187
*	20	1	PLUG	PL-108	
*	21	1	MARKER BEACON INDICATOR		3982823-4

* INDICATES GOVERNMENT FURNISHED EQUIPMENT

FOR TWO CONTROL BOX INSTALLATION 12 VOLT WIRING SEE DRAWING #H44H3885

FOR ONE CONTROL BOX INSTALLATION 24 VOLT WIRING SEE DRAWING #H44H3884

FOR TWO CONTROL BOX INSTALLATION 24 VOLT WIRING SEE DRAWING #H44H3883

FIGURE-1 (SEE NOTE 4)

LOCATION OF LOOP LP-21-(*) LP-31-(*)	LOCATION OF SENSE ANTENNA	INDICATOR POSITION TERMINAL 15 WIRE NO	INDICATOR POSITION TERMINAL 14 WIRE NO	LOOP L-R SWITCH TERMINAL 11 WIRE NO	LOOP L-R SWITCH TERMINAL 10 WIRE NO	COMPASS SENSE TERMINAL E1 WIRE NO	COMPASS SENSE TERMINAL A2 WIRE NO
TOP	TOP	745	746	715	728	725	769
TOP	BOTTOM	745	746	728	715	769	725
BOTTOM	TOP	746	745	715	728	769	725
BOTTOM	BOTTOM	746	745	728	715	725	769

Figure 5-15. Radio Compass ★AN/ARN-7—Wiring Diagram 12 Volt Single Control

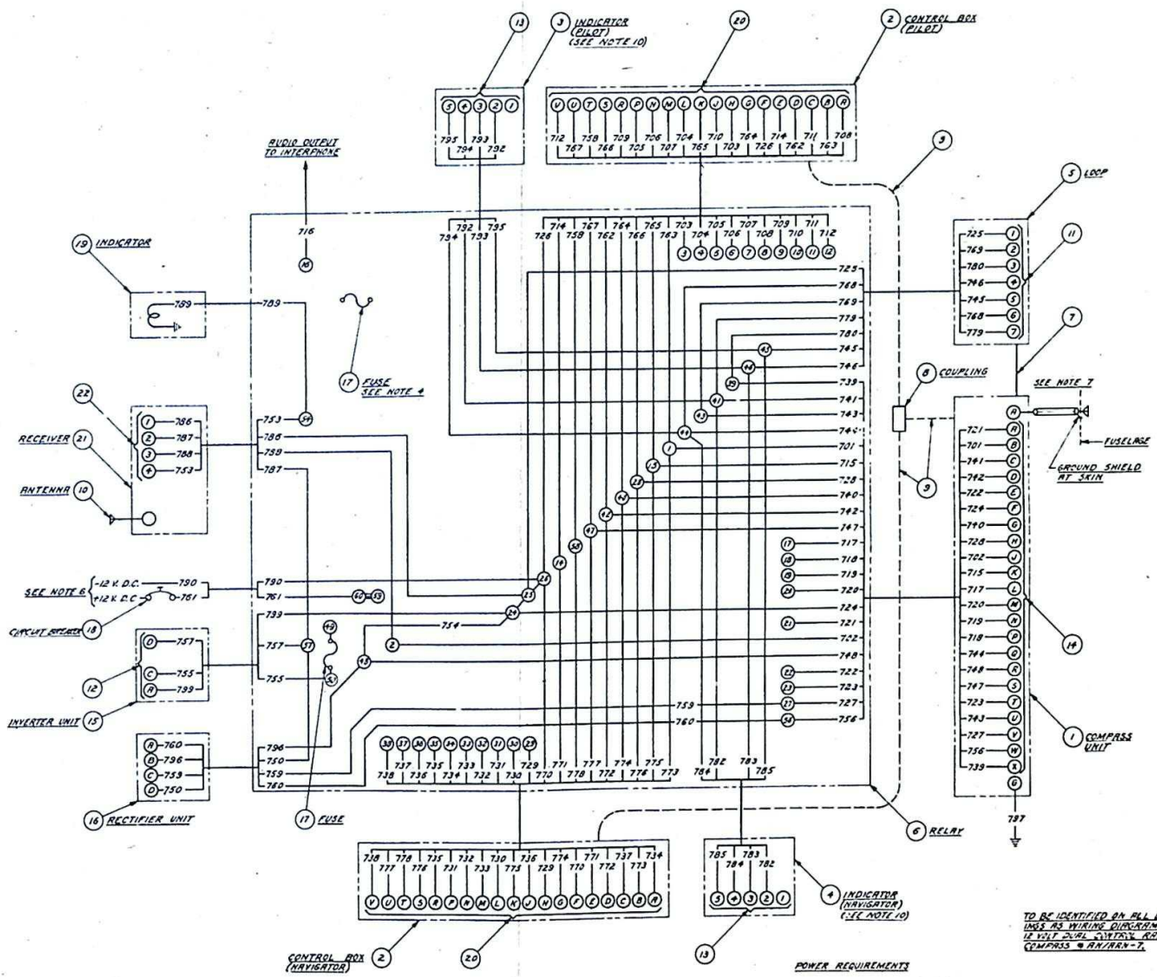
WIRE TABLE

ALL WIRES TO BE AIRCRAFT CABLE PER SPEC. AN-J-C-48, UNLESS OTHERWISE SPECIFIED.
4 INDICATES WIRES TO BE INDIVIDUALLY SHIELDED PER SPEC. 95-27273.
⊗ INDICATES WIRES WHOSE VOLTAGE DROP MUST NOT EXCEED LIMITS OF SPEC 95-32310.

REF NOTE	WIRE NO	WIRE NO	WIRE VOLTAGE	WIRE ALLOWABLE RESISTANCE IN OHMS (77°F)	MINIMUM CABLE SIZE PERMITTED	REF NOTE	WIRE NO	WIRE NO	WIRE VOLTAGE	WIRE ALLOWABLE RESISTANCE IN OHMS (77°F)	MINIMUM CABLE SIZE PERMITTED
	701	100		10	AN 20						
	702	225		10	AN 20	9	753	14		10	AN 20
	703	100		10	AN 20		754	0		.05	AN 18
	704	25		10	AN 20		755	115		.1	AN 18
	705	30		.1	AN 20		756	115		.1	AN 18
	706	30		.1	AN 20		757	14		.05	AN 12
	707	30		.1	AN 20		758	30		.1	AN 18
	708	5		10	AN 20		759	30		.1	AN 18
	709	3.1		.1	AN 20		760	115		.1	AN 18
	710	30		.1	AN 20		761	14		.1	AN 12
	711	108		.1	AN 20		762	30		.1	AN 20
	712	30		.1	AN 20		763	100	10		AN 20
	714	30		.1	AN 20		764	30		.1	AN 20
	715	108		.1	AN 20		765	108		.1	AN 20
2	716	100	18		AN 20		766	108		.1	AN 20
	717	25	10		AN 20		767	30		.1	AN 20
	718	30		.1	AN 20		768	50	1		AN 20
	719	30		.1	AN 20		769	20	1		AN 20
	720	30		.1	AN 20		770	0		.1	AN 20
	721	5	10		AN 20		771	30		.1	AN 20
	722	3.1		.1	AN 20		772	30		.1	AN 20
							773	100	10		AN 20
	724	0		.1	AN 20		774	30		.1	AN 20
	725	0		.1	AN 20		775	108		.1	AN 20
	726	0		.1	AN 20		776	108		.1	AN 20
	727	30		.1	AN 18		777	30		.1	AN 20
	728	108		.1	AN 20		778	30		.1	AN 18
	729	100	10		AN 20		779	25	1		AN 20
	730	25	10		AN 20		780	25		.1	AN 20
	731	30		.1	AN 20						
	732	30		.1	AN 20		782	25	1		AN 20
	733	30		.1	AN 20		783	50	1		AN 20
	734	5	10		AN 20		784	50	1		AN 20
	735	3.1		.1	AN 20		785	50	1		AN 20
	736	30		.1	AN 20	3	786	0		.1	AN 18
	737	108		.1	AN 20	3	787	14		.1	AN 18
	738	30		.1	AN 20	3	788	225	10		AN 20
	739	25		.1	AN 20	3	789	14	10		AN 20
	740	30		.1	AN 20		790	0		.1	AN 12
	741	25	1		AN 20						
	742	30		.1	AN 20		792	25	1		AN 20
	743	20	1		AN 20		793	50	1		AN 20
	744	32	1		AN 20		794	50	1		AN 20
	745	32	1		AN 20		795	50	1		AN 20
	746	32	1		AN 20		796	115		.1	AN 18
	747	32		.1	AN 20		797	0	GROUND		BRAID
	748	115		.1	AN 18						
							799	115		.05	AN 12
	750	14		.1	AN 18						

FIGURE 1 (SEE NOTE 5)

LOCATION OF LOOP LP-21-( ) OR LP-31-( )	LOCATION OF SENSE ANTENNA	INDICATOR ROTATION TERMINAL		LOOP L-R SWITCH TERMINAL		COMPASS SENSE TERMINAL	
		42	46	13	28	35	43
TOP	TOP	745	746	715	728	735	749
TOP	BOTTOM	745	746	728	715	749	735
BOTTOM	TOP	746	745	715	728	749	735
BOTTOM	BOTTOM	746	745	728	715	735	749



COMPONENT TABLE

ITEM	QUAN REQ	EQUIPMENT NOMENCLATURE DESCRIPTION	EQUIPMENT NOMENCLATURE TYPE NO.	SPEC. OR INSTALLATION DRAWING
* 1	1	RADIO COMPASS UNIT	★R-5/ARN-7	H44D3878
* 2	2	RAD'O CONTROL BOX	★C-9/ARN-7	H44D3861
* 3	1	BEARING INDICATOR	[illegible]	[illegible]
* 4	1	BEARING INDICATOR	I-82-1 (EXCEPT I-82-B)	H41D7020
* 5	1	LOOP	[illegible]	[illegible]
* 6	1	RELAY	BK-22-1 (EXCEPT BK-22 N&B)	H41B7016
* 7	1	CORD (LOOP CONNECTING)	CO-348 [illegible]	H41B4813
* 8	1	COUPLING "T"	MC-203 OR MC-203-A	H43A3233
* 9	3	TUNING SHAFT	MC-126	3C-D-3435
* 10	1	MARKER BEACON ANTENNA		H42E19712
* 11	1	PLUG	PL-112	3C-D-2259
* 12	1	PLUG	PL-0-267	AN 3109-22-22S
* 13	2	PLUG	PL-118	3C-D-3281
* 14	1	PLUG	PL-122	3C-D-3305
* 15	1	INVERTER UNIT	PE-109-( )	H43D9279
* 16	1	RECTIFIER UNIT	CA-59	H43D7646
* 17	2	FUSE 3 AMP (1 SPARE)		32271
* 18	1	CIRCUIT BREAKER	AN 3161-P 30	AN-C-77
* 19	1	MARKER BEACON INDICATOR		95B2823-4
* 20	2	MOUNTING (CONTROL BOX)	FT-224-( )	H44D3861
		MARKER BEACON	MC-39-B	
* 21	1	MARKER BEACON RECEIVER	BC-341-( )	H41B1187
* 22	1	PLUG	PL-108	

* INDICATES GOVERNMENT FURNISHED EQUIPMENT

FOR ONE CONTROL BOX INSTALLATION 12 VOLT WIRING SEE DWG. H44H3002.

FOR ONE CONTROL BOX INSTALLATION 28 VOLT WIRING SEE DWG. H44H3004.

FOR TWO CONTROL BOX INSTALLATION 28 VOLT WIRING SEE DWG. H44H3003.

TO BE IDENTIFIED ON ALL DRAWINGS AS WIRING DIAGRAM FOR 12 VOLT DUAL CONTROL RADIO COMPASS ★ AN/ARN-7.

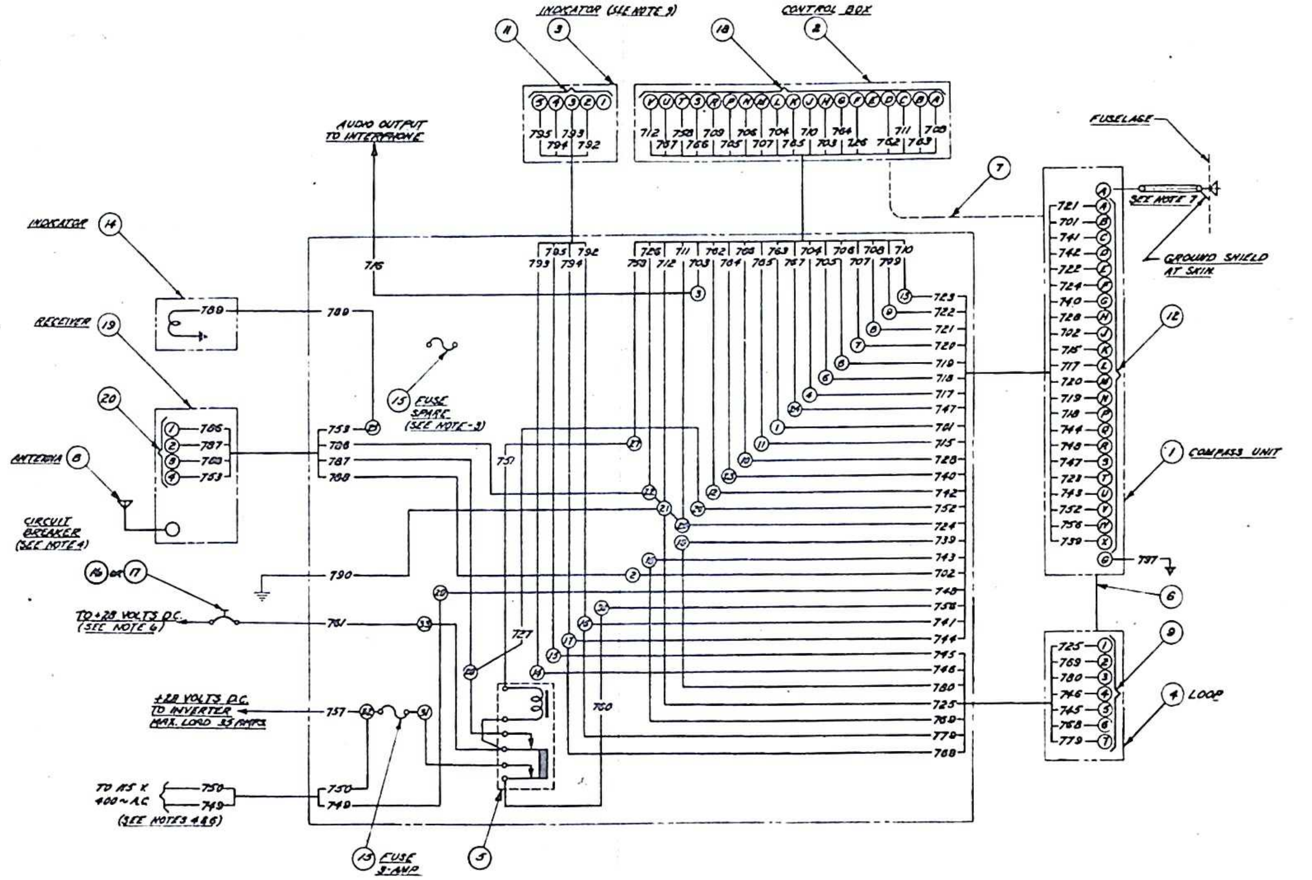
NOTES:-

7. SHIELDED LEAD-IN FOR SENSE ANTENNA TO BE AS SHORT AS POSSIBLE AND IN NO CASE TO EXCEED 30" IN LENGTH AND 22 MMF IN CAPACITY CHANGE. 30" OF 1/2" DIA. ALUMINUM TUBING CONTAINING INSULATED SPACERS AND W-106 WIRE.
6. MANUFACTURER SHALL INDICATE TO WHICH POINTS ON ELECTRICAL WIRING DIAGRAM THESE CONNECTIONS ARE MADE.
5. CONNECT WIRES 715, 725, 728, 745, 746, AND 788 AS SHOWN IN FIG. 1. DIAGRAM SHOWS CONNECTIONS FOR TOP MOUNTING OF LOOP AND SENSE ANTENNA.
4. CONTRACTOR SHALL PROVIDE MOUNTINGS FOR THE SPARE FUSES.
3. RELAY BK-22-1 HAS ALL NECESSARY TERMINALS FOR INTER-CONNECTIONS SHOWN ON THIS DIAGRAM. TERMINAL NUMBERS SHOWN ARE MARKED ON RELAY.
2. INTERPHONE WIRE TO BE AN-20, INDIVIDUALLY SHIELDED, PER SPEC. 95-27273.
1. ALL TERMINAL STRIPS REQUIRED IN THE INSTALLATION OF THE WIRING SHALL BE MADE OF SUITABLE INSULATING MATERIAL AND WITH TERMINAL SPACING TO PROVIDE ADEQUATE VOLTAGE BREAKDOWN.
11. WHEN CONTROL BOX (ITEM ②) IS MOUNTED ADJACENT TO A GUN OR GUN TURRET WHERE GUN CUSHION OF GUN FIRE CAUSES EXCESS VIBRATION THE CONTROL BOX SHALL BE SHOCK MOUNTED.
10. WHEN INDICATOR'S I-82-(), TO BE (AS ITEM ① OR I-82-() (ITEM ④) ARE MOUNTED ON AN UNGROUNDED STRUCTURE, CONNECT PIN J OF PLUG PL-108 TO SOME PART OF THE AIRPLANE OR THE RADIO EQUIPMENT WHICH IS AT GROUND POTENTIAL.
9. WHEN MARKER BEACON RECEIVING EQUIPMENT BC-1083-( ) IS INSTALLED, DELETE ITEMS ⑨, ⑩, ⑪, AND ⑫, AND WIRES 781, 782, 783, 784, AND 789. SEE DRAWING H44D3438.
8. RADIO COMPASS UNIT ① IS HARD-LY WIRED FOR HIGH IMPEDANCE OUTPUT. WHEN LOW IMPEDANCE OUTPUT IS REQUIRED, FOLLOW PROCEDURE FOR CHANGING OUTPUT IMPEDANCE OUTLINED IN INSTRUCTION BOOK. WHEN RELAY UNIT BK-22-E OR K IS USED WITH OTHER COMPASS UNITS, TERMINAL ⑯ PROVIDES A LOW IMPEDANCE OUTPUT CONNECTION AND TERMINAL ⑭ A HIGH IMPEDANCE OUTPUT CONNECTION. WHEN BK-22-E OR K IS INSTALLED AS PART OF ★ARK-7, TERMINAL ⑭ SHOULD BE USED WHEN EITHER HIGH OR LOW IMPEDANCE OUTPUT IS REQUIRED.

Figure 5-16. Radio Compass ★AN/ARN-7—Wiring Diagram 12 Volt Dual Control

WIRE TABLE									
ALL WIRE TO BE AIRCRAFT CABLE PER SPEC. AN-J-C-48 UNLESS OTHERWISE SPECIFIED + INDICATES WIRES TO BE INDIVIDUALLY SHIELDED PER SPEC 95-27273 ⊗ INDICATES WIRES WHOSE VOLTAGE DROP MUST NOT EXCEED LIMITS OF SPEC 95-32310									
REF NO	WIRE NO	MAXIMUM OPERATING VOLTAGE	MAX ALLOWABLE RESISTANCE IN OHMS	MINIMUM AN SIZE PERMITTED	REF NO	WIRE NO	MAXIMUM OPERATING VOLTAGE	MAX ALLOWABLE RESISTANCE IN OHMS	MINIMUM AN SIZE PERMITTED
	701	100	10	AN-20		752	30	.1	AN-18
	702	225	10	AN-20	8	753	30	10	AN-20
	703	100	10	AN-20					
	704	25	10	AN-20					
	705	30	.1	AN-20		755	115	.1	AN-18
	706	30	.1	AN-20	4	757	30	.05	AN-12
	707	30	.1	AN-20		758	30	.1	AN-20
	708	5	10	AN-20		760	115	.1	AN-18
	709	31	.1	AN-20	4	761	30	.1	AN-18
	710	30	.1	AN-20		762	30	.1	AN-20
	711	108	.1	AN-20		763	100	10	AN-20
	712	30	.1	AN-20		764	30	.1	AN-20
						765	108	.1	AN-20
	715	108	.1	AN-20		766	108	.1	AN-20
8	716	100	10	AN-20		767	30	.1	AN-20
	717	25	10	AN-20		768	50	1	AN-20
	718	30	.1	AN-20		769	20	1	AN-20
	719	30	.1	AN-20					
	720	30	.1	AN-20					
	721	5	10	AN-20		779	25	1	AN-20
	722	31	.1	AN-20		780	25	.1	AN-20
	723	0	.1	AN-20	8	786	0	.1	AN-18
	724	0	.1	AN-20	8	787	30	.1	AN-18
	725	0	.1	AN-20	8	788	225	10	AN-20
	726	0	.1	AN-20	8	789	30	10	AN-20
	727	30	.1	AN-18		790	0	.01	AN-18
	728	108	.1	AN-20					
	739	25	.1	AN-20		792	26	1	AN-20
	740	30	.1	AN-20		793	50	1	AN-20
	741	25	1	AN-20		794	50	1	AN-20
	742	30	.1	AN-20		795	50	1	AN-20
	743	20	1	AN-20					
	744	50	1	AN-20		797	0	GROUND	GROUND
	745	50	1	AN-20					
	746	50	1	AN-20					
	747	30	.1	AN-20					
	748	115	.1	AN-18					
	749	115	.1	AN-18					
	750	115	.1	AN-18					
	751	30	.05	AN-20					

FIGURE-1 (SEE NOTE-5)							
LOCATION OF LOOP LP-21-()B LP-21 ON AIRCRAFT	LOCATION OF SENSE ANTENNA	INDICATOR ROTATION		LOOP L-R SWITCH		COMPASS SENSE	
		TERMINAL		TERMINAL		TERMINAL	
		15	14	11	10	21	18
		WIRE NO		WIRE NO		WIRE NO	
TOP	TOP	745	746	715	728	725	769
TOP	BOTTOM	745	746	728	715	769	725
BOTTOM	TOP	746	745	715	728	769	725
BOTTOM	BOTTOM	746	745	728	715	725	769



COMPONENT TABLE					
	ITEM	QUAN REQ'D	EQUIPMENT NOMENCLATURE: DESCRIPTION	TYPE NO	SPEC OR INSTALLATION DRAWING
*	1	1	RADIO COMPASS UNIT	★R-5/ARN-7	H44D3878
*	2	1	RADIO CONTROL BOX	★C-4/ARN-7	H44D3881
*	3	1	BEARING INDICATOR	[illegible]	[illegible]
*	4	1	LOOP	[illegible]	[illegible]
*	5	1	RELAY	SW-172-()	H42B3129
*	6	1	CORD (LOOP CONNECTING)	[illegible]	H41B4650
*	7	1	TUNING SHAFT	MC-124	SC-D-2035
*	8	1	MARKER BEACON ANTENNA		
*	9	1	PLUG	PL-112	
*	11	1	PLUG	PL-118	
*	12	1	PLUG	PL-122	
	14	1	MARKER BEACON INDICATOR		39B2823-4
	15	2	FUSE 3-AMP (1-SPARE)		32271
	16	1	CIRCUIT BREAKER	AN 3161-P5	AN-C-77
	17	1	CIRCUIT BREAKER	AN 3161-P35	AN-C-77
	18	1	MOUNTING (CONTROL BOX)	FT-224-()	H44D3881
			MARKER BEACON	RC 43-B	
*	19	1	MARKER BEACON REC	BC-357-()	H44G1018T
*	20	1	PLUG	PL-108	

* INDICATES GOVERNMENT FURNISHED EQUIPMENT

FOR TWO CONTROL BOX INSTALLATION 24 VOLT WIRING SEE DWG H44H3883

FOR ONE CONTROL BOX INSTALLATION 12 VOLT WIRING SEE DWG H44H3886

FOR TWO CONTROL BOX INSTALLATION 12 VOLT WIRING SEE DWG H44H3885

NOTES:—

8 WHEN MARKER BEACON RECEIVING EQUIPMENT RC-193-() IS INSTALLED DELETE ITEMS ⑧, ⑭, ⑲, ⑳; WIRES 793, 794, 787, 788 AND 789. SEE DRAWING H44D3490.

7 SHIELDED LEADIN FOR SENSE ANTENNA TO BE AS SHORT AS POSSIBLE AND IN NO CASE TO EXCEED 30 IN IN LENGTH AND 25 MMF IN CAPACITY. EXAMPLE: 30 IN OF 1/4 IN OD ALUMINUM TUBING CONTAINING INSULATED SPACERS & W-106 WIRE

6 MANUFACTURERS SHALL INDICATE TO WHICH POINTS ON ELECTRICAL WIRING DIAGRAM THESE CONNECTIONS ARE MADE

5 CONNECT WIRES 715, 725, 728, 745, 746, & 769 AS SHOWN IN FIG I. DIAGRAM SHOWS CONNECTIONS FOR TOP MOUNTING OF LOOP AND SENSE ANTENNA

4 IF A USING INVERTER UNIT AC-32270, DELETE CIRCUIT BREAKER ⑯ INSTALL CIRCUIT BREAKER ⑰ IF WIRE 757 CHANGE SIZE OF WIRE 761 TO AN 12.

3 CONTRACTOR SHALL PROVIDE MOUNTINGS FOR THE SPARE FUSES

2 INTER HOME WIRE TO BE AN-20 INDIVIDUALLY SHIELDED PER SPEC 95-27273.

1 ALL TERMINAL STRIPS REQUIRED IN THE INSTALLATION OF THE WIRING SHALL BE MADE OF SUITABLE INSULATING MATERIAL AND WITH TERMINAL SPACING TO PREVENT AGAINST VOLTAGE BREAKDOWN

10 WHEN CONTROL BOX (ITEM 2) IS MOUNTED ADJACENT TO A GUN OR GUN TURRET WHERE CONCUSSION OF GUN FIRE CAUSES EXCESS VIBRATION, THE CONTROL BOX SHALL BE SHOCK MOUNTED

9 WHEN INDICATORS I-81-() OR ID-65/ARN (ITEM ③) ARE MOUNTED ON AN UNGROUNDED STRUCTURE, CONNECT PIN 1 OF PLUG PL-112 TO SOME PART OF THE AIRPLANE OR THE RADIO EQUIPMENT WHICH IS AT GROUND POTENTIAL.

POWER REQUIREMENTS
115 V 400 CYCLES AC. 85 V.A. (MAX)
28 VOLTS D.C. 168 WATTS (MAX)

Figure 5-17. Radio Compass ★AN/ARN-7—Wiring Diagram 24 Volt Single Control

WIRE TABLE

ALL WIRE TO BE AIRCRAFT CABLE PER SPEC. AN-J-C-48 UNLESS OTHERWISE SPECIFIED.
+ INDICATES WIRES TO BE INDIVIDUALLY SHIELDED PER SPEC 95-27273.
Ⓧ INDICATES WIRES WHOSE VOLTAGE DROP MUST NOT EXCEED LIMITS OF SPEC. 95-32310.

REF NOTE	CIRCUIT NO.	MAXIMUM OPERATING VOLTAGE	MAX. ALLOWABLE RESISTANCE IN OHMS	MINIMUM AN SIZE PERMITTED	REF NOTE	CIRCUIT NO.	MAXIMUM OPERATING VOLTAGE	MAX. ALLOWABLE RESISTANCE IN OHMS	MINIMUM AN SIZE PERMITTED
	701	100	10	20					
	702	28.5	10	20					
	703	100	10	20	9	753	50	10	20
	704	25	10	20					
	705	50	.1	20					
	706	50	.1	20		756	115	.1	18
	707	50	.1	20	10	757	50	.05	12
	708	5	10	20		758	50	.1	18
	709	3.1	.1	20					
	710	50	.1	20					
	711	108	.1	20	10	761	50	.1	18
	712	50	.1	20		762	50	.1	20
						763	100	10	20
	714	50	.1	20		764	50	.1	20
	715	108	.1	20		765	108	.1	20
2	716	100	10	20		766	108	.1	20
	717	25	10	20		767	50	.1	20
	718	50	.1	20		768	50	1	20
	719	50	.1	20		769	20	1	20
	720	50	.1	20		770	0	.1	20
	721	5	10	20		771	50	.1	20
	722	3.1	.1	20		772	50	.1	20
	723	0	.1	20		773	100	10	20
	724	0	.1	20		774	50	.1	20
	725	0	.1	20		775	108	.1	20
	726	0	.1	20		776	108	.1	20
	727	50	.1	18		777	50	.1	20
	728	108	.1	20		778	50	.1	18
	729	100	10	20		779	25	1	20
	730	25	10	20		780	25	.1	20
	731	50	.1	20					
	732	50	.1	20		782	25	1	20
	733	50	.1	20		783	50	1	20
	734	5	10	20		784	50	1	20
	735	3.1	.1	20		785	50	1	20
	736	50	.1	20	9	786	0	.1	18
	737	108	.1	20	9	787	50	.1	18
	738	50	.1	20	9	788	225	10	20
	739	25	.1	20	9	789	50	10	20
	740	50	.1	20		790	0	.01	18
	741	25	1	20					
	742	50	.1	20		792	25	1	20
	743	20	1	20		793	50	1	20
	744	50	1	20		794	50	1	20
	745	50	1	20		795	50	1	20
	746	50	1	20					
	747	50	.1	20		797	0	GROUND	BRAID
	748	115	.1	18		798	115	.1	18
	749	20	.1	18					
	750	115	.1	18					

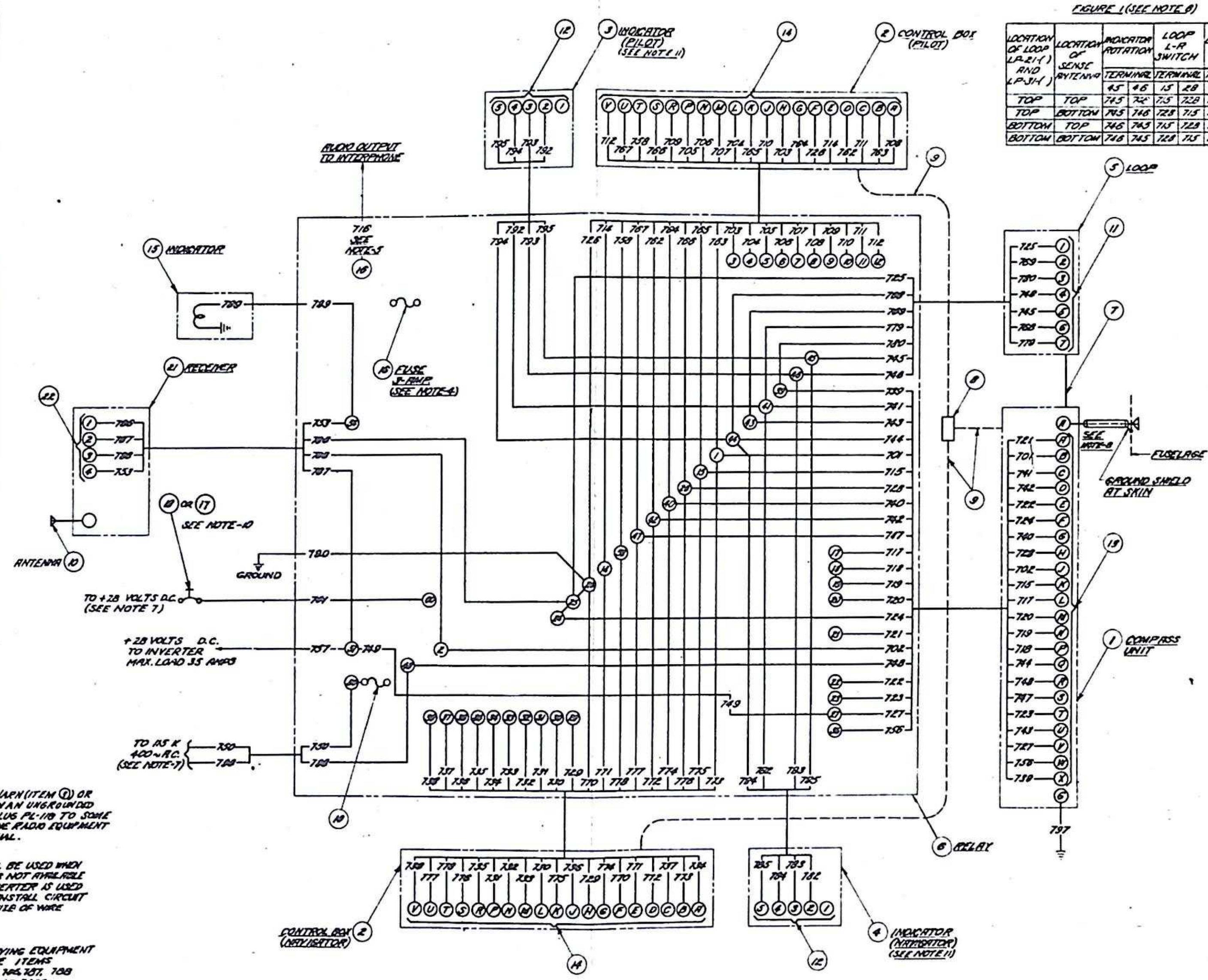


FIGURE 1 (SEE NOTE 8)

LOCATION OF LOOP LP-21-( ) AND LP-31-( )	LOCATION OF SENSE ANTENNA	INDICATOR ROTATION TERMINAL 45	INDICATOR ROTATION TERMINAL 46	LOOP L-R SWITCH TERMINAL 15	LOOP L-R SWITCH TERMINAL 28	COMPASS SENSE TERMINAL 25	COMPASS SENSE TERMINAL 43
TOP	TOP	745	746	715	728	725	769
TOP	BOTTOM	745	746	728	715	769	725
BOTTOM	TOP	746	745	715	728	769	725
BOTTOM	BOTTOM	746	745	728	715	725	769

COMPONENT TABLE

	ITEM	QUAN. REQ'D	EQUIPMENT NOMENCLATURE: DESCRIPTION	EQUIPMENT NOMENCLATURE: TYPE NO.	SPEC. OR INSTALLATION DRAWING
*	1	1	RADIO COMPASS UNIT	*R-5/ARN-7	H44D3878
*	2	2	RADIO CONTROL BOX	*C-4/ARN-7	H44D3881
*	3	1	BEARING INDICATOR (PILOT)	[illegible]	H41D7018
*	4	1	BEARING INDICATOR (NAVIGATOR)	I-82-( ) (EXCEPT I-82-A)	H41D7020
*	5	1	LOOP	[illegible]	[illegible]
*	6	1	RELAY (SEE NOTE 5)	[illegible]	H41B7018
*	7	1	CORD (LOOP CONNECTING)	[illegible]	H41B4650
*	8	1	COUPLING ("T")	MC-203 OR MC-203A	H40R5290
*	9	3	TUNING SHAFT	MC-124	SC-D-2085
*	10	1	MARKER BEACON ANTENNA		H42G1872
*	11	1	PLUG	PL-112	
*	12	2	PLUG	PL-118	
*	13	1	PLUG	PL-122	
*	14	2	MOUNTING (CONTROL BOX)	FT-224-( )	H44D3881
*	15	1	MARKER BEACON INDICATOR		3982823-4
	16	2	FUSE, 3 AMP. (1 SPARE)		32271
	17	2	CIRCUIT BREAKER	AN-3161-P5	AN-C-77
	18	2	CIRCUIT BREAKER	AN-3161-P35	AN-C-77
	MARKER BEACON EQUIP.			RC-43-B	
*	21	1	MARKER BEACON REC.	BC-357-( )	H41G10187
*	22	1	PLUG	PL-108	

* INDICATES GOVERNMENT FURNISHED EQUIPMENT

8 CONNECT WIRES 715, 725, 728, 745, 746 & 769 AS SHOWN IN FIGURE 1. DIAGRAM SHOWS CONNECTIONS FOR TOP MOUNTING OF LOOP AND SENSE ANTENNA.

5 RADIO COMPASS UNIT ① IS NORMALLY WIRED FOR HIGH IMPEDANCE OUTPUT. WHEN LOW IMPEDANCE OUTPUT IS REQUIRED FOLLOW PROCEDURE FOR CHANGING OUTPUT IMPEDANCE OUTLINED IN INSTRUCTION BOOK. WHEN RELAY UNIT BK-22-E OR K IS USED WITH OTHER COMPASS UNITS, TERMINAL Ⓢ PROVIDES A LOW IMPEDANCE OUTPUT CONNECTION AND TERMINAL Ⓡ A HIGH IMPEDANCE OUTPUT CONNECTION. WHEN BK-22-E OR K IS INSTALLED AS PART OF *AN/ARN-7, TERMINAL Ⓡ SHOULD BE USED WHEN EITHER HIGH OR LOW IMPEDANCE OUTPUT IS REQUIRED.

4 CONTRACTOR SHALL PROVIDE MOUNTINGS FOR THE SPARE FUSES.

3 RELAY BK-22-( ) HAS ALL NECESSARY TERMINALS FOR INTER-CONNECTIONS SHOWN ON THIS DIAGRAM. TERMINAL NUMBERS SHOWN ARE MARKED ON RELAY.

2 INTERPHONE WIRE TO BE AN-20 INDIVIDUALLY SHIELDED, PER SPEC. 95-27273.

1 ALL TERMINAL STRIPS REQUIRED IN THE INSTALLATION OF THE WIRING SHALL BE MADE OF SUITABLE INSULATING MATERIAL AND WITH TERMINAL SPACING TO PROVIDE PROTECTION AGAINST VOLTAGE BREAKDOWN.

11 WHEN INDICATORS I-81-( ), ID-65/ARN (ITEM ③) OR I-82-( ) (ITEM ④) ARE MOUNTED ON AN UNGROUNDED STRUCTURE, CONNECT PIN 1 OF PLUG PL-118 TO SOME PART OF THE AIRPLANE OR THE RADIO EQUIPMENT WHICH IS AT GROUND POTENTIAL.

10 INVERTER UNIT AC-32270 WILL BE USED WHEN 115 VOLT, 400 CYCLE, SOURCE IS NOT AVAILABLE IN THE PLANE. WHEN THE INVERTER IS USED DELETE CIRCUIT BREAKER ⑰. INSTALL CIRCUIT BREAKER ⑱ & WIRE 757. CHANGE SIZE OF WIRE 761 TO AN-12.

9 WHEN MARKER BEACON RECEIVING EQUIPMENT RC-193-( ) IS INSTALLED, DELETE ITEMS ⑩, ⑮, ㉑, ㉒ AND WIRES 753, 786, 787, 788 AND 789. SEE DRAWING H44D3430.

8 SHIELDED LEAD-IN FOR SENSE ANTENNA TO BE AS SHORT AS POSSIBLE AND IN NO CASE TO EXCEED 30" AND 25 MMF. IN CAPACITY. EXAMPLE: 30" OF 1" O.D. ALUMINUM TUBING CONTAINING INSULATED SPACERS AND W-106 WIRE.

7 MANUFACTURER SHALL INDICATE TO WHICH POINTS ON ELECTRICAL WIRING DIAGRAM THESE CONNECTIONS ARE MADE.

POWER REQUIREMENTS
115 V. 400 CYCLES A.C. 85 V.A. (MAX)
28 VOLTS D.C. 16.8 WATTS (MAX)

FOR ONE CONTROL BOX INSTALLATION 12-VOLT WIRING SEE DWG H44H3886

FOR ONE CONTROL BOX INSTALLATION 24-VOLT WIRING SEE DWG H44H3884.

FOR TWO CONTROL BOX INSTALLATION 12-VOLT WIRING SEE DWG H44H3885.

Figure 5-18. Radio Compass ★AN/ARN-7—Wiring Diagram 24 Volt Dual Control